

COGS 101 Final Project

Fall 2013

Description: The class collaboratively wrote a HOW TO STUDY manual for an audience of their choice, CWRU first year students. Each group chose a topic covered in the course (e.g., attention, memory, cognitive development...), each student read and summarized primary research articles about that topic, and groups then distilled the material into a set of study tips. Enjoy!

Topics

General

Attention

Categorization

Distributed cognition

Mastery vs. performance orientation

Memory: General

Memory: State dependent learning

Memory: Sleep

1 General (combines multiple topics)

The Study Games

Group 13. Bingqing Hu, Kayla Stoltz, and Erlein Tacastacas



The Unofficial Survival Guide to The Study Games

By Bingqing Hu, Kayla Stoltz, and Erlein Tacastacas

"Here's some advice. Stay alive." - Haymitch, *The Hunger Games*

In class: If, during lecture you come across a concept that you have difficulty understanding, ask your professor immediately. Do not linger on the problem you will mostly likely miss other important points in the lecture.

After class/before and during homework:

- > When reading material wield your highlighter with care as it is your weapon of choice! Overhighlighting DOES NOT HELP. When done right however, it can be useful for organization!
- > When studying practice problems, look at different ways of representing the problems, such as drawing pictures, writing your thought processes about the problem, or creating a diagram. Free up some working memory to help increase your accuracy!
- > Have confidence when you're studying. Know that others have taken the same class and were confronted with the same questions and have succeeded. You can too!

Before next class:

- > Make flashcards for association between facts and review them over and over during free time. Repetition results in fluency and fluency increases confidence.
- > Repetition: review your notes after class and when you do your homework, not just before a test. More exposure to facts and associations will help you recall them quicker.
- > Working in a group is not always helpful. Balance group work with personal study time. College students often do not know how to collaborate properly. Pick a good group!

Now it's time to study..... LET THE GAMES BEGIN! Before exam:

- > When reviewing for a test, if you don't know something, rather than overthinking it, if you cannot find the answer, ask and communicate with other people and the professor about it. Sometimes there are hard questions. Do not pay too much attention as it probably only constitutes only a small part of the test. Make sure you get all the other points and make notes of the things you don't understand then ask the professor or classmates
- > Space out your studying. No matter the method you are using, it will be more effective if you space it out. Plan ahead, use a calendar, whatever it takes! Using a diagram or organizer will keep you from stressing over everything you have to study for. Save your working memory for when you actually study!
- > CRAMMING is not effective for retention. You may be able to remember the material you crammed for a short period of time, but when it comes to elaborating on that material after your exam you will be at square one. Then, as a consequence when the next exam comes you will have double the material to cram.
- > Have a list of studying approaches. If one approach to studying does not work, after trying it for a while, give up that approach and try a new one. Use the approach that works best for you!

During exam:

- > When taking tests don't fixate on hard problems, circle them, move on and then come back. Stop thinking about the hard problem completely when you move on.
- > Do first the easy problems that you can both quickly answer and answer with high confidence; if an answer comes to your head immediately, pick that answer. Don't dwell over the problem. Make a mark by it if you are truly uncertain but move on and stick with your initial answer.
- > Be sure to allocate time to do the questions with the most parts and that are worth the most points. Save yourself from stressing over these problems when time is running out!
- > "Crying is not an option." - Katniss Everdeen, *The Hunger Games*

After you have put in all the work, its finally time for the exam. Now, trust your gut. The longer you take on a question, the more likely you are to compromise on your answer. Be confident, know that you studied hard and that you should and carry you head high all the way through to the end of the test. And may the odds be ever in your favor.

The test is over. Turn in your exam and emerge a victor from the test-taking arena. "You've got to go through it to get to the end of it." - Suzanne Collins, *Catching Fire*

Advice for Incoming Freshmen

Group 29. Cara Brown, Adithi Iyengar, Jacob Kasper, Ellie Rambo

Introduction

Freshman year of college is a highly stressful experience. It is helpful to know a few tricks and methods in order to succeed in remembering what one learns. Through our research, we have highlighted several key aspects of memory and memory retention and subsequent learning devices that can be used to improve encoding and recall which provide for optimal learning. Freshman who utilize the following information will be more successful and more at ease when taking finals. We chose to focus on memory during final exams because these cumulative tests require students to recall information from the entire semester. We have compiled advice for freshman students that include tips on how to study, when to sleep, and how to manage stress during final exams.

How to Study

Finals are an opportunity to return to the course material, thereby reviewing all previous information and developing a cumulative understanding of the course concept. In order to maximize retention of the course information, studying must be distributed throughout the term. Periodically reviewing material is the most effective way to study for a final. Even so, it is possible to regulate memory retention because consolidation, that is, the strengthening of memory associations, is an active process. By actively thinking the information being studied will have utility in the future, retention will be higher. Just as well, completing practice problems that test cumulative knowledge increases retention more so than repeatedly listening to or reading about a given topic. Actively solving problems that are relevant to the course work can increase overall retention

Increasing Confidence and Decreasing Stress

There are many factors that affect memory recall and retention, such as a person's emotional state during learning. Confidence will help in the long run when striving to perform at an optimal level for final exams. As a matter of fact, there has never been a better age to memorize, retain, and recall information as the late adolescence. There is a drastic increase in memory retention from childhood to adolescence. With this information, it is important to approach learning and reviewing material with a confident mindset and the knowledge that one has the capacity to learn and retain material well. Another important factor in determining memory capacity is stress. Increased stress impairs memory encoding, as well as memory recall, due to the increase in glucocorticoids. Increased stress also decreases ability to retain memory in an accurate manner and even remember events incorrectly. Therefore, it is important to relax and approach studying for finals in the least stressful way possible.

When to Sleep

While students study for finals, they often sacrifice sleep for time spent reviewing course material. Although reviewing information is important, sleep is also important for optimal memory retrieval. A full night of sleep helps students recall more information than a partial night of sleep or a night without sleep. Both slow wave and REM sleep are important for memory recall, so it is important to get sleep during the early part of the night, when slow wave sleep usually occurs, and during late night hours, which should be filled with REM sleep. Sleep deprivation has a severe detrimental effect on memory recall and its effects can even be observed in brain scans.

2 Attention: Attention restoration theory

Attention restoration theory

Group 10. Lucy Adelson, Linhan Li, Mary Lowery

Directed attention is a type of attention that requires conscious effort. Working on something like homework for a long time reduces your ability to focus your attention. However, studies have shown that interaction with nature can

restore the capacity of directed attention; this is called Attention Restoration Theory. If you want to improve your focus during a long day of studying, take a walk outside in a garden or park. Even having plants in your workspace or looking at pictures of nature can help!

3 Categorization

Categorization for Optimal Learning

Group 11. Jiayuan Zhang, Magle Shi, Mahima Devarajan, Scott Penfield

Category learning is extremely useful in studying. The fact that categories are flexible allows for the human mind to constantly update one's categories as he/she learns more information.

When attempting to learn new material, it is possible for a student to actively improve this process by making connections between old and new concepts, thereby improving their learning. Furthermore, it is emphasized in a recent study that categorization produces better results in performance as opposed to pure memorization.

Additionally, performance on some category learning tasks (those where the rule that dictates categorical placement is implicit and procedurally based) is shown to improve when one begins with more difficult examples and the examples get progressively easier.

A number of recent studies also provide strong evidence that working memory is highly correlated with success in all types of category learning tasks. Although it is unclear whether or not working memory can be improved long-term, exercise has been shown to improve it in the short run. Take the time to get outside while studying - not only does it relieve stress, but it will also improve your working memory and category learning abilities!

Key Take-Aways:

- Look to categorize new information and connect new and old ideas as much as possible rather than simply memorizing them
- Especially on more abstract concepts, beginning with more difficult examples can improve performance
- Take the time to exercise to improve both working memory and category learning ability

Categorization

Group 28. Karen Booth - Solomon Hwang - Jared Klemm - James Lee

Dear Freshman of CWRU,

From our research we have learned a few important tips that relate categorization and how efficiently you are studying. Categorization is the process of grouping things in your memory; through this process you can more easily retrieve the information from your memory. Here are some important tips to keep in mind while studying.

- Your mood matters- a study found that when participants identified themselves as either sad or calm they were more likely to have a narrower focus while learning new information. This helped the participants to better recall simple information. So if you're too excited while studying it may be hard for you to concentrate on the important facts. Remember to stay calm and go easy on the coffee!
- Plan out your studying ahead of time – several studies have found that learning is more efficient and effective when similar topics are studied consecutively. Spend some time studying for one class, then move onto another rather than moving quickly from one subject to another. The amount of attention you can devote to studying will be higher if you divide your study time into chunks for each subject.

- Time is everything- some research suggested that it is easier to learn new information while completing an unrelated working memory task, but don't start studying while you clean just yet! There were some flaws with this research. It was found that the participant who were completing the working memory task as they learned information had been given more time than the other participants. So when the study was redone with the time being equal for all participants they found that the biggest factor in how well the new information was learned was how much time they were given to work through and process the info. Moral of the story, no procrastinating! You need time to learn all the information you are about to be taught in your first year of University.
- Set up a study curriculum for yourself – studies have found that you will learn more effectively if there is some sort of study plan for you to follow. Having a study plan to follow will increase the amount of attention you'll have for studying and allow you to more easily retrieve the information later on. This will be more effective than impromptu studying random topics in any order.
- Don't be afraid to focus on details - Learning more details about a topic will not hurt your understanding of it. In fact, according to a study, the more information that you are exposed to about a subject, the easier it is to learn and recall information about the subject. So, when leaning a new topic, try to identify as many specific details that you can about the subject. This will help you recognize other things that relate and categorize them into the same group.
- Think about how you interpret information - It is easy for our brains to identify relationships in data that we are seeing. The ability to integrate new information is a major benefit that we have, but it can also lead us to the wrong conclusions. A study has suggested that if a rule is determined and found to work, our brains will likely want to stick to that rule in new data. Although we can usually draw accurate conclusions, be careful about creating too detailed rules that you think can be applied all parts of a topic. Categorization of problem solving based on rules can create big problems.

4 Performance vs. ability

Mastery vs. performance orientation

Group 4. Abby Armato, Matt Conley, Kushagra Gupta, Lauren Lucente

Definitions And Examples:

Mastery, also labeled as task-involvement or learning goals, focuses on the development of competence and full subject comprehension

"I desire to completely master the material presented in this section of class"

Performance-approach behavior entails the attainment of competence in order to be compared with others

"I am striving to demonstrate my ability relative to others on this exam"

Performance-avoidance activity involves the avoidance of incompetence relative to others

"I just want to avoid doing poorly on this exam"

THE FIST

Group 4



From left to right:

Lauren Lucente
Matt Conley
Kushagra Gupta
Abby Armato

¹Schraw, G. (1998). Promoting general metacognitive awareness. *Instructional Science*, 26, 113-125

Mastery VS Proficiency

... And You!

Intro

The topic we chose to focus on is mastery versus performance-oriented learning. We discuss the nuances between mastering information to be used on a daily basis and merely keeping the information temporarily active for a test. We have researched the two distinct learning processes to achieve these two different objectives. Looking at the process of obtaining the knowledge used to achieve these goals, we found that the mastery of the information would create a genuine understanding of the material, which would amount to a broader context of applications, whereas the process of simply performance-oriented learning would not be as vast.

"Students with mastery orientation seek to improve their competence. Those with performance orientations seek to prove their competence."¹

Tips

- Get excited about the information that interests you, but don't neglect the rest
 - Communicate with your professors for clarification about their expectations
 - Find relevance in the topic you are studying, which will boost motivation to genuinely understand the material.
 - Form study groups of people who are interested in learning and are engaged in the topic, which will encourage you to work hard to understand the material
 - Focus on your own knowledge and comprehension of the material and not on peers' comprehension
 - Be open to conceptual change and willing to accept that you may need it
 - A lot of testing is performance-oriented, so master the material, but also make sure you can perform the tasks the teacher is asking of you
- Try to avoid performances-oriented types of review because they can be discouraging when you don't understand something or get something incorrect
 - Don't concentrate on doing well, aim to understand the material
 - The amount of effort you put in studying will increase your performance and a deeper understanding of your material.
 - Study only until you are sure you have mastered the material; spending a realistic amount of time studying reflects an attempt to understand the material well as to aiming for performance
 - Focus your studying on what the professors deem most important
 - Set realistic expectations for yourself, as you'll enjoy studying for a class if you perceive that you are doing well in it and will be more willing to study to understand the material.

5 Distributed Cognition

Distributed Cognition and How YOU Can Use it to Your Advantage!

Group 19. Yash Biyani, Alexandra Helgert, Rupika Kapur, Sahil Patel

First of all, what is distributed cognition? Well, the basic idea of distributed cognition is that your thinking is not confined to just your mind alone – your learning can actually be affected by socializing with other people and by interacting with your environment! Below are some strategies that show how you can use distributed cognition effectively to maximize your own personal academic success while here at Case! Our main focus is working with peers in groups (cognition distributed across people), and taking advantage of technology (cognition distributed across your environment).

Group Work:

In most universities, cognition is most often distributed amongst students through collaborative learning, such as study groups and peer tutoring.

Studies have shown that working in a group causes individual students to

- Have better recall of the material
- Demonstrate more interest in the subject being studied
- Learn better skills to study on their own from their peers.

However, when working in a group, you want to make sure you are practicing good habits that will lead to success.

1. Make sure your group size is small to medium, about three to six people.
2. Actively listen and let everyone voice their opinion
3. Stay on topic – no talking about weekend plans!
4. Take turns teaching one another – alternate between asking detailed questions and giving in-depth answers

When used correctly, working in groups causes you to reach more individual goals, be more actively motivated, and get more out of the subject matter. So get out there, find a group, and work together to become better students!

Technology:

Multi-media resources serve two major purposes for your learning:

1. By using technology that helps associate pictures and diagrams with text information, technology can help you hold more information in your working memory.
 - For example, if learning a language, try going outside and using a camera to take pictures of objects, and then associate words with these pictures! Make connections in your mind that will help you recall info later.
 - **Studies have shown you can retain 36 – 116% more information!**
2. When working in a group, taking advantage of technology can make you more efficient to make more time for learning!
 - a. Emails and group calendar apps increase group connectivity, sharing, and expressiveness
 - b. The use of electronic white boards improved discussions, productivity, and output

Whether working in a group or by yourself, remember to take advantage of our modern technology to improve your memory, be more efficient, and be prepared to succeed in college!

Distributed Cognition: How Technology Affects the Way You Study

Group 21. Kevin Smith, Nick Stevens, and Alex Choi

Tips:

- The internet is a very powerful tool. Don't be afraid to search databases online or to use trusted websites to gather your information needed to study.
- However, according to various studies, those who use the internet for excessive amounts of leisure activity often have poor impulse control. If you find yourself distracted by various places on the internet, seek some sort of software that allows you to temporarily block websites on your computer while you are studying, which can be easily found in various locations on the web!
- If possible, it may be beneficial to study on a computer in a library, where there may be restrictions to various websites and you won't have access to as many games.
- Prior to using the internet, it may be useful to determine exactly where you need to be and what resources you'll need while online. Use the list to restrict yourself to only the relevant websites in regards to what you are doing.
- Avoid checking your email, your various social media sites, or any gaming services. If you have them open in another tab or minimized on your screen, you're still likely to access them if you find yourself getting distracted.
- College can be hard and a lot of work but discussing with your friends is a great idea. Try having some online discussions about what you learned in class this gives your brain a chance to work in different ways and really consolidate your understanding of the subject matter.
- Ask your professor and see if you can get the class to be technology based. Research shows significant results
- Branch outside of your college. Join a forum about a general topic. For example if you're in physics join a physics forum to get another look from others' perspectives. The college might be different and you may not know the people but the material stays the same all over the world!
- Join a forum for fun!! Don't hesitate to do something for fun as a creative outlet. Hard work is great but you want to enjoy your time in college and beyond just hanging out with friends an online forum or discussion community provides a creative outlet and can stir the thoughts in your brain.
- When you can use computers in class, don't waste time by secretly playing games or chatting with friends, focusing on class while making use of the technology, will allow you to take in the information better
- If your class has an online component, take full advantage of it as well as all the features that it provides, as it has been demonstrated that classes that make use a technology generally can have a greater impact than classes that don't
- Technology advanced learning results in a greater number of learning materials and increased learning time
- While using online software and computer programs to better understand the course information will not automatically improve your performance, it will allow you to more efficiently take in and better comprehend knowledge

Proper Usage of Technology in College

Group 22. Justine De Angelis, Alan Chuang, Nathan Huynh

Proper Usage of Technology in College

By: Justine Anne De Angelis, Alan Chuang, and Nathan Huynh, Group 22

Technology in CWRU Courses

- Be sure you understand the technology your class is using before you use it
- If not, research the product or ask the professor for help
- Be sure you understand each step and minute detail and are able to explain to others
- Trust the technology your professor provides, but be wary of its accuracy
- Express interests in the products that were helpful to promote future usage!
- Make sure to mention the technology in course evaluations to provide feedback for future classes

How Does Instructional Technology Help Students?

Instructional technologies should be comprised of several principles, such as multimedia, interactivity, and temporal contiguity.

- Multimedia provides illustrations to go along with words, allowing students to connect the two, which helps them construct mental models.
- Interactivity means that the technology promotes working with others or "hands-on." This allows students to help categorize materials and be more productive, rather than working alone and "hands-off."
- Temporal contiguity is when graphics are shown concurrently with words. This helps students to hold the words and graphics in their working memory at the same time, making it more likely for them to build mental connections.

THE DANGERS OF USING TECHNOLOGY

Facts about Internet Addiction

- Internet addiction is the overuse and misuse of internet literacy which leads to physical and psychological problems
- Heavy leisurely Internet use will likely lead to interference in academic, whereas light internet usage seems to have a positive effect on academic relationships and grades
- Online publishing skills, such as blogging, were found to be significantly linked with addiction
- Addicts reported problems with managing time, sleeping, and eating; in more serious cases, people became antisocial
- There is a significantly higher chance that a male will become addicted to or dependent on the Internet than a female will
- Studies show that lonely or depressed people are more likely to become addicted
- One way of fixing addiction may be to construct a schedule for using the internet

Leisurely Hours Spent Online (on avg.)

Category	Hours Spent
Average Person	8
Addict	24

Internet addicts spend about 20-25 hours per week online, which is triple the amount the average person spends online

What does technology help promote?

Studies show that group support systems, such as online discussion boards and chat rooms support asynchronous communication, which takes place outside of real time. This ultimately helps students to enhance their participation skills, group work, and decision quality. This differs from synchronous, "face-to-face," communication because it allows students to use the internet as a source to freely express their opinions.

Distributed Cognition: A How-To Guide for Group Studying

Group 23. Chris Hafley, Vichit Lorn, Shankar Nigam, Andrew O'Desky

Distributed cognition is a psychological theory which says that our cognition intimately depends on the people around us. It is not so hard to see from this that it must have important consequences for how to study effectively in a group. We looked through eight cognitive science studies on the distributed cognition of groups of students and pulled out some pointers that might be helpful for you in your undergraduate studies. In general our studies found that students tend to perform better when studying in groups as opposed to studying in isolation. Of course, this does not imply studying in groups will give you a 4.0 nor does it imply that you should force yourself to study with others if you know yourself to work better in isolation, but it is something to keep in mind. Here are some tips for effectively studying in a group. It is beneficial to all for members to be outgoing and actively share their thoughts. Group members are more willing to share their thoughts if others do it first, and communicating thoughts about concepts being learned is essential! Studies find that talking through ideas is one of the best ways to assimilate them because it involves both memory retrieval *and* an active understanding of the topics. Working in groups of four or more *usually* does not have any increased benefit over smaller groups, because large groups tend to break into smaller sub-groups anyways. Studies found that in practice, groups of four or more tend to have one member who

does not actively participate which negatively impacts the group dynamic. Because of this one study recommends working in groups of two or three. *However*, the study notes that for advanced courses students performed better on tests if they studied in pairs rather than groups of three, and students performed better if they studied in groups of three rather than pairs for more basic courses. Finally, groups work best if members are comfortable with others, so study with friends! It can be both a fun social activity *and* an effective studying session so long as you keep off Reddit — ☺.

Good luck and have fun, Your fellow students.

How Can I Effectively Use Technology?

Group 9. Sarah Resnick, Christie Page, Mitch Hopkins, Jalia Hubbard

-Educate yourself on what's out there. Case Western offers numerous tools such as MediaVision, Blackboard, and Lynda. Learning through technology is only effective if you have a personal connection with the technology, so find programs, operating systems, and devices that work best for your personal learning styles.

-Don't limit yourself. Use technology to find outside resources to help you understand course material better. For example, when studying a topic that may seem abstract, search for a visual aid or simulation.

-Use learning software on your phone. It allows you to engage with the information in an informal setting, which makes you more comfortable with it. Also, it allows for continuity and personalization, so your grasp of the content will improve.

-Use the resources effectively. When using interactive tools like Wolfram Alpha, actually use the hints that they provide instead of going right to the solution. You are more likely to learn mastery of the topic if you solve it, even with the help, than if you just look at the answer.

-Diversify. You should use a combination of different technology and non-technological based tools to study and take notes. While technology can be beneficial to learning, it still poses some issues; it may break or become distracting. Try to also use traditional education methods when it makes sense in context.

-Don't fall behind. When you're absent from lecture, you can use technology to catch up on the material and work you've missed. Programs like MediaVision allow you to virtually participate so you can easily keep up with your work.

-Always be in touch. When doing group projects, use social and collaborative tools such as Google Drive and Dropbox for consistent communication with your group members.

-Two heads are better than one. Work in groups on assignments such as online homework, even if the instructions don't explicitly tell you to do so (as long as they don't explicitly say to work alone!). Students learn better with guidance and they can use the opportunity to play both teacher and student roles.

-Be aware of your mental state. Even using these tools, you get what you put in. If you don't remain engaged and put forth effort, you won't improve. Don't let technology distract you. If you find yourself distracted, take a break so that you can refocus in a few minutes.

6 Memory: General

Reducing Interference and Utilizing Consolidation: A CWRU First Year Student's Guide to Effective Learning

Group 7. Sophia Senderak, Gina Belli, Dan Karesh, Aviva Gersovitch

Reducing Interference and Utilizing Consolidation: A CWRU First Year Student's Guide to Effective Learning

Consolidation

Consolidation is the process that helps memories become more stable and resistant to interference. There are two types of consolidation: System Consolidation (takes place at night and involves multiple brain systems) and Synaptic Consolidation (occurs on the level of individual synapses, and takes place both at night and during the day). *Here are some ways to utilize these types of consolidation:*

-System Consolidation is good at weeding out pointless information and focusing on useful information, and is subconsciously driven by our goals.

Study tip: If you know that learning **Z** is important and remembering **A** isn't so important, you're more likely to remember **Z** than you are to remember **A**. So, you should have a clear idea of what's most important to know before you sleep. Also, giving yourself motivation and a potential reward for remembering information makes it more likely to be consolidated.

-There's less interference with information the sooner you sleep after learning the information.

Study tip: Ideally, try to study before bed. In addition, taking naps after class can help cement the information into long term memory. If you have a morning class, a nap during the day will prevent the gradual loss of information that would occur otherwise.

-Slow Wave Sleep is important for consolidation.

Study tip: You need to go through a complete sleep cycle if you want good consolidation. Ideally, you should sleep eight hours.

- However, you can help your memory even while you're awake. Studies show that you learn better when you produce dopamine.

Study tip: Lots of things produce dopamine (exciting situations, exercise, etc.) so, take a jog before you study and it might help you better retain information.

Interference

Interference is when some information in your memory makes it harder to remember other information. Primacy effects come from proactive interference (when early information interferes with later information) and Recency effects come from retroactive interference (when later information interferes with earlier information). *How you can avoid it:*

Study tip: If you are aware of primacy and recency effects, you can learn to practice information that is likely to be forgotten. For example: items in the middle of a list or chapters in the middle of a text book.

Study tip: If you are aware of these types of interference you will have a better idea of what information you need to spend a longer amount of time studying for. This can help you to choose better study strategies and will make you more likely to remember what you're studying.

Study tip: In order to study optimally, you should start by studying a concept that is difficult for you. Then, study a familiar, or easier concept that you do understand. This will allow for the previous information to solidify itself in your memory. Lastly, go back and review the old, hard material at the end. This will ensure the more difficult concepts stay fresh in your mind and will likely promote better performance on an exam.

Happy Studying!

How To Use Your Memory For Optimal Learning

Group 15: Aram Aslanian-Persico, James Veeneman, Galen Yasumura

Memory is the capacity to retain information over time. The process involves a system of storing and retrieving information. The structure of memory can be broken down into 3 sections: sensory memory, short-term memory, and long-term memory. Each section is characterized by the type of information being encoded and the capacity and duration of information that can be stored.

Sensory memory is one of the main systems of memory that involves a quick-decaying storage of memory. Sensory memory can be divided into iconic and echoic memory. In a classroom setting, visual information (e.g. a diagram) is stored in your **iconic memory** and auditory information (e.g. a professor's comment) is stored in your **echoic memory**. For most people, visual input will be more useful than auditory, but combining both together is the best. Paying attention is necessary to the learning process. Watching or listening to recorded lectures to study can offer more opportunities to experience sensory information and create associations that will aid short-term memory. This will improve your ability to elaborate on information you have already learned and develop multiple paths to retrieve information at a later date. When studying, using diagrams when possible can increase the chance of acquiring information into memory. Encoding information along multiple different paths will set you up for better retention. During its duration, some sensory information is transferred to short-term memory.

Short term memory (or working memory) is a system that actively holds multiple pieces of transitory (non-permanent) information and allows them to be manipulated in the mind. Short-term memory also acts as a holding area for information that could eventually be put into long-term memory. The longer the information is held in the short-term memory, the better chance it has of being permanently converted to the long-term memory. The capacity of the short-term memory can be increased by a process called "chunking". **Chunking** is when humans group information into small chunks of relevant information. The duration of the short-term memory can be increased by **rehearsal** (repetition) of the information. According to a study performed at Michigan State University, the duration of short-term memory can also be increased by increasing the time spent encoding that information (Fenn and Hambrick, 409). In other words, increased time spent reviewing certain information increases the time it can be stored in short-term memory. Mental state also affects how information is stored in the short-term memory. It is much easier to recall and retain information if it is encoded while in a similar mental state each time. From short-term memory, information can be transferred into long-term memory. The brain does this throughout the day, but is most active during sleep. In order to make the best use of studying time, it is important to begin study early and to study just one subject at a time. Increasing the encoding time of the information you are trying to learn will allow you to keep it in your short-term memory for longer. Secondly, it is important to get adequate **sleep**. A large amount of the transfer of information from short-term memory to long-term memory happens during sleep.

Long-term memory is exactly what it sounds like. It is memory that involves the storage and recall of information over a long period of time. The process involves taking information from LTM and recalling it to STM for use. There are two types of long term memory: declarative and procedural. **Procedural** (implicit) memory is remembering how to do something (i.e. remembering how to ride a bicycle). **Declarative** (explicit) memory is remembering "what" (facts, faces, etc.). Declarative will be the memory you use to study. Declarative memory can be broken down into semantic and episodic. Semantic memory is about facts, episodic memory is about events. Once knowledge has been encoded and stored in LTM one must be able to retrieve it or else the information is useless. There are different types of **retrieval** and they are recall, recollection, recognition, and relearning. **Recall** is retrieving information without a cue; **recollection** is based on reconstructing memory based on logic; **recognition** is based on identifying previously learned information; and **relearning** is about reviewing previously learned information which can strengthen LTM. The first 3 are all valuable to understand for students and have good examples of use in exams for example recall can be used on fill in the blank, recollection can be used to write an essay when given bits of info, and recognition can be used on multiple choice. Relearning can then be associated with **elaboration** which is connecting new information to information that is already stored in your memory. This allows for easier memorization and recall of the new information.

Memory: Recalling and Retention

Group 16. Caleb Parker, Jamie Han, Katherine Holland, Anna Pickard

One of the most fundamental skills college freshmen will require for their four years in college will be studying techniques and habits to produce strong performance in their courses. There are many techniques that students use, some of which are more successful than others. This paper will outline those that have been studied in length and show strong correlation in enhancing performance. A difficulty in finding effective studying techniques lies with the

differences in students' personal preferences on how to study. First, get the right mindset! Studies show that students who hold more confidence and positive attitude before a test will result in improved test performance from learning and retaining new information more consistently. (Cheong et al, 2004). Now it is time to begin the learning process! When learning new material, actively making connections between new information and that, which was previously known, is shown to be effective in recalling information in the future (Kintsch, 1994). Time for a nap! Ten minute rests after learning new information will induce a period of wakefulness, which will encode the memories of recent behavior to long-term memory subconsciously (Dewar, 2012). Now it is time to study! A combination of multiple techniques is proven to achieve the best recollection for tests (McKenzie & Sawyer, 1986). The Read-Recite-Review helps to better consolidate new information and ease the retrieval process (McDaniel et al, 2009). Mnemonics enhance the students' ability to acquire, assimilate and encode information (Bellezza, 1982). Additionally, mnemonics alone are best for short-term memory, and lack greatly in assisting long-term memory recollection (McKenzie & Sawyer, 1986). However, test-like practice enhances students' ability to retain and recall information in the long-term (Roediger & Karpicke, 2006). According to Dunlosky's study that allocated study techniques and tested their effectiveness, practice tests were the most widely utilized and helpful for students in improving study abilities. Using the above strategies, either individually or together, will aid you in test preparation during your freshman year. These strategies are well studied, and have documented proof of their assistance in retaining and recalling information.

7 Memory: State-dependent learning

The Importance of State-Dependent Learning for CWRU First-Year Students

Group 1. Nick Stevens, Yifei Shang, Connor Swingle, Brian Ward

What is State-Dependent Learning?

State-Dependent learning is a phenomenon in which an individual is better able to recall information when he or she is in the same mental state as when he or she encoded the information. Understanding this concept is important for first-year CWRU students because performance on tests and in the classroom can be affected by the congruence of their states of mind while studying and taking tests.

How can common substances affect state-dependent learning?

Alcohol: While it is not encouraged to drink alcohol before studying, studies have found that the mild consumption of alcohol before memorization and before recall has no effect on implicit memory. This was true regardless of whether participants consumed alcohol before recall, before encoding or both. However, in regards to explicit memory, participants had a much better explicit memory of their knowledge when they were in the same state of alcohol consumption in recall as in memorization.

Marijuana: Smoking marijuana, unsurprisingly, has a negative effect on a person's cognitive function. However, due to the effects of state-dependant learning, an individual who is under the influence of marijuana when they study information will have better recall of that information under the influence of marijuana. While it is not encouraged to be high while studying, if you are, it may benefit performance if you are high during a test as well.

Caffeine: Though caffeine is a stimulant, drinking caffeine before a test to keep yourself awake will not necessarily improve performance. Research suggests that being in a caffeinated state will improve a person's ability to recall something only if that person were also in a caffeinated state when they learned it. This means that the best way to maximize performance on a test is to avoid loading up on caffeine unless that's how you studied.

How can medications affect state-dependent learning?

Ritalin: Researchers concluded that Ritalin would best benefit hyperactive children and boost their performance on tasks if they were on a long-term and consistent drug therapy. This means that taking Ritalin inconsistently will not improve performance.

Amphetamine (present in many ADHD medications): It is shown that when students learned about a task with amphetamine in their system, their performance would decrease when they perform the task with no amphetamine in their system. This warns students who would potentially take ADHD medication as a performance enhancer that if they don't take it when they study, taking it before a test would inhibit their performance.

Amobarbital: Amobarbital is a hypnotic drug that is used to treat anxiety and insomnia. The same pattern as those of the aforementioned drugs was found. This suggests that if students needed the drug and took it as they learned, they should not stop taking it before a test even though it is a hypnotic medication.

How can emotions affect state-dependent learning?

Stress: Stress is a common part of a student's life. However, don't worry about its effect on your performance. Regardless of the level of stress when encoding or retrieving information, performance is the same.

Sadness: A student's mood can impact their ability to perform. Strangely, sadness can actually work in favor of the student because by improving analytical thinking. When a student is sad, their focus is narrowed, which reduces the likelihood that they will be fooled by misleading answers.

State-dependent Learning in the College Environment

Group 26. Natalie Doe, Kapil Patki, and Ryan Yavorsky

Review:

As our contribution to the COGS 101 How to Study Manual, our group examined the effects of state-dependent learning caused by common substances/activities in the typical college environment. The following substances/activities were investigated: caffeine, alcohol, methylphenidate (Ritalin), exercise, mood, nicotine, and cannabis. To begin our section, several equations must be assessed:

(1) [studying with substance/activity] + [testing without substance/activity] = lower success

(2) [studying with substance/activity] + [testing with substance/activity] = higher success

(3) [studying without substance/activity] + [testing with substance/activity] = lower success

(4) [studying without substance/activity] + [testing without substance/activity] = higher success

These "Equations to Success" illustrate how maximum success can be achieved in respect to popular activities and substances that permeate the college environment. The first bracket of each equation illustrates studying for an exam with or without a specific activity or substance. For example, studying with caffeine or without caffeine can be substituted into the first bracket. Next, each primary bracket is added to a secondary bracket. This secondary bracket describes taking an exam (that was studied for in the primary bracket) with or without the same substance used in the primary bracket. For instance, the second bracket could refer to taking an exam with or without caffeine. Finally, each bracket is set equal to the amount of success that will occur in each situation. An overall example would follow this general format:

[studying with caffeine] + [testing with caffeine] = higher success

It can then be gathered that consistency leads to success in the studying to testing domain. Inconsistencies from studying to testing, such as studying with caffeine and testing without caffeine, will lead to diminished success compared to keeping things consistent from studying to testing. Moreover, students should learn that the state they are in while studying, whether it be caffeine-induced, nicotine-induced, or even mood-induced, should be the state they remain in for testing, thus avoiding the downfalls of state-dependent learning and ameliorating academic success.

State-Dependent Learning

Group 2. Maia Delegal, Daniel Roca-Atkinson, Miruna Gorodea, Evangelina Din

The study about exposure cues and alcoholics shows that association plays a part in state-dependent learning (Hodgson, 2001). For example, studying a particular topic in one setting and studying another topic in another setting would allow you to associate the recall of topic-specific information with memories of the space in which you studied that topic. It's proven that less material is learned under the influence of drugs and alcohol, and the few things that are learned under the influence differs in quality from what is learned while sober (Peterson, 1977). According to this information, it's probably best not to alter your mental state with drugs while studying, even if you plan to replicate the state while applying the material you learned. What you learn while sober will be

more useful than what you learn while intoxicated, for example. In addition, attempting to store any information while under the influence can lead to dissociation - an inability to transfer any learned information from one state to the next - so, again, it is a bit risky to consume alcohol because it does have an effect on how well the memory works. (Hinrichsen, Katahn, & Levenson, 1973).

As exhibited by studies that have found the type of drug or substance does not have an effect on state dependent learning, we know that recall ability doesn't differ between substances but rather rests more heavily upon whether or not you are in the same state during learning as you are during recall (Bustamante, 1969). Since the type of alteration to your mental state during learning doesn't matter as much as the replication of that state during testing, rather than take drugs while studying, a more positive state alteration may be used for studying. For example, establishing healthy sleeping patterns will allow you to have the same amount of sleep while studying as the amount of sleep you run on while testing. In regards to aerobic exercise, your physiological state will be altered if you exercise before studying. A similar physiological state will take hold in testing if you are prone to test-related anxiety, which ties to the basic principles of state dependent learning. If you are given information while running, for example, the recall of that information will be easier if you are running while recalling (Miles, 1998). This can be replicated without exercising merely by placing time constraints on studying that will parallel the physiological effects that time constraints of testing may have.

Studies show that implicit memory becomes less reliable as one ages. However, the effects of state-dependent learning do not vary from younger to older adults. So while it may be more difficult for you to remember material you study as you go through school, healthy utilization of state-dependent learning may still be helpful (Russell and Schramke). Regardless of whether you choose to practice testing time constraints while studying, monitor the number of hours you sleep before studying and testing, or some other healthy employment of state-dependent learning, make sure the state in which you are tested is the same as the state in which you learned the material being tested.

Alcohol, Substance Addiction & Learning

Group 18. McFerran Landis, Ian Ulman, Max Zimon

Studies have shown that alcohol and other substances can seriously affect the cognitive functioning of adolescents, particularly certain tasks related to learning. Worse still, succumbing to alcohol addiction is made easier in adolescence because of changes in the underlying structure of the brain (which continues to change into young adulthood in most people). Evidence also shows that those who are more impulsive and likely to take risks (and therefore might already be predisposed to poor learning habits) are more likely to be heavy drinkers, starting a dangerous and destructive biological cycle of addiction.

Similarly, marijuana in moderation also has dangerous long-term effects for young adults like us! It is not, in fact, less dangerous than booze, and its effects on the brain can rival alcohol's. One recent study conclusively finds that for young adults, it significantly impairs verbal learning and memory - that is, when having a variety of words spoken to them, pot-smoking subjects in our age range were able to recall fewer of them than the control, non-druggie group, indicating that smoking more weed than one joint's worth per week would make it harder for you to remember vital information mentioned in class! Heavy users have it worse: this kind of impairment is directly related to frequency, duration, and concentration of usage.

So, using illicit substances can impair academic performance, making them a bad choice for college students. As freshmen in college, it is especially important to know this due to a special vulnerability to these types of activities. Young adults are more likely to engage in risky behaviour without proper regard for the consequences. Studies have also shown that younger people are not well suited to evaluating the consequences of their actions, even when the negative results are obvious. Make the right decisions early on, or you might not realize your mistake until it is too late.

Effects of mood on learning

Group 6. Hope Ho, Emily Malec, Eddie Villarreal

Mood-dependent learning is an important aspect of studying that students must take into account. Studying can be affected by positive or negative moods, inducing moods, and by stress.

Positive and negative moods can affect the way cognitive processing occurs. Studies show that positive and neutral mood increases cognitive flexibility (Nadler, Rabi, & Minda, 2010). Therefore we can suggest that students do not start studying when they are in a negatively altered state of mind. Positive moods also correlate with positive behavior, and according to research, positive moods facilitate memory (Hettena & Ballif, 1980). We would recommend that students study while in a positive mindset, therefore total recall will be better

Stress is an induced mood that can greatly affect the ability of students to learn. It serves as a way to divide attention, making the learner focus less on the material at hand and more on their emotion (Kromann, Jensen, & Ringsted, 2010). There are benefits to learning under stress if the test will be taken in the same type of stress, but it is a variable too hard to control for college students to take advantage of (Schwabe & Wolf, 2010). Finding a spot where you are not affected by stress takes time, but it is key to making the most out of your study sessions.

Inducing a positive mood can result in the increase of efficiency in tasks such as creative thinking, problem solving, and forming new associations in the brain (Greene & Noice, 1988). Since all of these tasks are useful when studying, college students can benefit from inducing a positive mood state through things like recreational activities. Negative moods also have benefits such as increasing an individual's ability to solve problems (Mitchell & Phillips, 2007). College students can thus attempt to alter their mood to increase performance, although positive mood are recommended for purposes of stability.

Ultimately, it is recommended that students maintain a positive mood while learning, that they induce a positive mood in order to enhance their cognitive state, and that they avoid stress.

8 Memory: Sleep

Sleep and Studying

Group 5. Bri Torres, Charlotte Palmer, Mark Patteson, and Sararose Nassani

Sleep deprivation among college students has reached gross proportions. Wide-eyed freshmen, thrown into the crucible of the college workload, often embark on the fabled "All-Nighter," staying up all night to study. But by missing sleep or even skipping sleep entirely, the students may actually impair their abilities to learn. Sleep is crucial in consolidation and retrieval, both processes required for learning. Consolidation stores knowledge from new material in long term memory while retrieval recalls information during assessments. So here are a few tips to use sleep to your advantage:

First, sleep deprivation causes huge deficits in memory consolidation. A student may stay up all night studying, but he or she is likely not to learn at full efficiency. A sleepy student will find it harder to make new memories and retrieve old ones. So, in summation, don't subject thyself to sleep deprivation, folks.

Any sleep is better than no sleep. While a full night's sleep encourages optimal learning, even short naps can have measurable benefits in memory consolidation and recall. The oft lauded 10 minute "power nap" significantly increases both efficiency and accuracy of recall. A 60 minute nap will boost learning and memory even more.

Despite the benefits of naps, a full night's sleep is ideal. Not only will a full night's sleep increase recall rate, but more time spent asleep, will increase the amount of memories that are stabilized in long-term memory.

Also, sleeping earlier in the night better preserves information. Specifically, recognition memory sharpens after a full night's sleep, resulting in faster response times and more accurate answers on multiple choice tests.

The timing of learning also matters. The afternoon is a better time for learning declarative information dealing with facts and specific events, while the evening is better for learning procedural tasks such as how to ride a bike. Study for school, a declarative task, in the afternoon and have sports practice, a procedural task, in the evening!

Finally, the ability to retain and accurately recall information begins to deteriorate around the age of 29. As 18 and 19 year-old college freshman, first-years are at the optimal time in life to be able to absorb information and accurately recall it. However, as with any skill, raw talent is not enough to get by on. By getting enough sleep, first-years will embed information more thoroughly into their subconscious and will hone their naturally acute memories.

Sleep

Group #12. Tricia Conti, Matt Karpinski, Bethany Kaufman.

Get a good night's sleep the night before a test. Studies have shown that sudden exposure to even partial sleep deprivation (i.e. only getting 4 hours of sleep the night before an exam) results in significantly poorer performance in cognitive functioning when compared to no sleep deprivation at all (Pilcher and Huffcutt, 1996).

But if you can't get a full night of rest... even just taking a quick nap the night before an exam can improve your score. In one study, those who had as little as a 90- minute nap did much better on cognitive recall and cognitive performance with a response-time task than a control who didn't take a nap (Mednick, *et al.*, 2003).

Nap between study sessions. Slow-wave sleep, one of the non-REM sleep stages, is important for the consolidation of declarative memory. Declarative memory is used to store both facts and personal experiences. During consolidation, memories are solidified in the brain and become less prone to interference with additional information studied after napping. By moving information to more permanent storage areas within the brain, consolidation during sleep frees up brain synapses for additional encoding (information processing and storing) (Antonenko, *et al.*, 2013).

Sleep is an essential compliment to studying. Each time a fact is reviewed, recalling it becomes easier. This is known as the Old-New Effect; the second time a stimulus is seen, it produces a less negative event-related potential (brain response) than the first time it was seen because less effort is required to follow a strengthened retrieval path. Sleep intensifies the Old-New Effect, making your studying pay off through faster information recollection (Mograss, *et al.*, 2006).

The amount you sleep can affect your grade point average. One study has found that sleep length can have an effect on grade point average. Participants that got 9 or more hours of sleep a night were found to have significantly higher GPAs than those that got 6 or fewer hours of sleep a night (Clanton, *et al.*, 2001).

Sleep deprivation affects your cognition in negative ways. The most prominent effects of sleep deprivation on cognition are decreased attention and reaction times. Learning and memory are also largely affected. Sleep deprivation leads to difficulty in forming new memories and retrieving previous ones. Innovative thinking and verbal learning are also negatively affected. Sleep deprivation also effects emotions and behaviors, causing a decrease in mood, increase in frustration, and increase in risk-taking tendencies (Killgore, 2010).

Group 14: Jacob Kliever, Chris Miller, Han Xu, Zhouyang Zhang

How sleep can improve your GPA

Group 3: Yasha Duggal, Gili Ornan, Alejandro Sosa, Diana Feng

How Sleep Can Improve Your GPA

As a first year student at Case Western, it can be assumed that you want to optimize your study time, not only for your promising future, but for the simple fact that you want time to do other activities on campus. This is where sleep comes in. Sleep is a critical part of every person's life, considering the average person commits about one-third of their life to it. Many factors control our sleep patterns.

Notably, sleep is usually not prioritized in the to-do list of student's checklist for succeeding in college. Sleep is important because it is crucial to one of the most necessary processes for optimal performance in all your classes--memory consolidation and learning. One research study found that over 50% of those questioned were unsatisfied with their sleep habits. To help you avoid being a part of this group, here are a few important key elements that you can remember that can make your time at Case Western successful and enjoyable. (Eliasson, Eliasson & Lettieri, 2009).

Go sleep early rather than later!

Going to sleep earlier improves memory opposed to staying up later in the night. Studies have shown that going to sleep earlier results in an improvement in recollection of facts and a quicker response time for more complex questions. The study also supports the idea that early sleep will result in fewer errors during recall (Pijhal, W., & Born, J. 1997).

Naps: A Wonderful Refresher

Naps have been shown to be extraordinary helpers to people who are attempting to learn more

information, faster. Naps that are shorter than 45 minutes consist primarily of Stage 2 sleep, during which much of memory consolidation, or strengthening, occurs. Studies have proven that if you were to take a nap after studying a set of information, you are far more likely to remember it and to recall it better at the time of examination. It is for these reasons that a short "power nap" can be almost as refreshing and useful as a full night's sleep! (Walker, et. al., 2004)

Try To Do Your Memorization During Nap Time

Researchers have found out that memory reactivation while you are awake helps strengthen individual memories, while reactivation during sleep helps links related memories together (Oudiette, et. al, 2013). So instead of plugging in your earplug and listening to music while napping in the basement of Bingham, it might not be a bad idea to do your French listening during your nap time after all!



USE SLEEP TO HELP YOURSELF LEARN!

Group 8. Victoria Reese, Kassandra Corter, Katie Lum, Walter Huang

Sleep and Memory:

- Fact: A good night's sleep before learning is as pertinent as it is afterwards. You need sleep, ALL the time!
- New information transfers into long-term memory while we sleep, so its important to get enough pillow-time or we might lose the information that has not yet been transferred. (Kilgore, 2010)
- PET Scans show that brain activity levels when you're awake and asleep are about equal in some periods of sleep.. More proof that while you're nodding off, your brain keeps on working to consolidate what you learned while you were awake. (Walker, 2006)
- Sleep enhances memories! It can help restore previously lost memories and make memories more accessible when you're awake. (Walker, 2006)

"...and like our body would fall apart if the atoms did not attract each other, our consciousness would fall apart into as many pieces as moments there are without the binding power of memory"
-Ewald Hering, Psychologist

Keep motivated but not stressed:

- Strong motivators, like upcoming tests for example, encourage memory retention: your brain works harder to learn when you know a big exam is coming up! (Born and Ines Wilhelm, 2011)
- **Try not to get to take this motivation too far though; stress decreases the amount of REM sleep (rapid eye movement sleep, aka, deep sleep) you get at night, which hurts your memory functions. (Youngblood, Smagin et. al, 1999)**

Sleep Duration and Napping

- Your brain naturally rehearses and consolidates your memories during the REM Sleep and stage 2 sleep.. To reap these benefits, 7-9 hours a day of sleep is recommended.
- Restricting sleep for prolonged periods ends badly: Studies show that sleeping for only 6 hours every night for two weeks impacts you the same as two nights of complete sleep deprivation! (Kilgore, 2010)
- A 60-90 minute nap increases your recall of information learned beforehand. (Born and Wilhelm, 2011)
- However, a full night's sleep after the day of learning without the nap produces the same memory retention level. So: nap when you need it, it will help for the day! If you don't feel drowsy, feel free to power on til bedtime! If you get a sufficient night's rest, you'll still retain the information just as well.

Warning: All-nighters will backfire.

- Your working memory (the place information goes before it's transferred into long-term) only has so much space. The longer you keep awake, the less likely you will consolidate all of the new information you're learning into long term memory. (Walker, 2010)
- Sleep deprivation is as harmful as drinking: 24 hours of sleep deprivation yields similar impaired attention level as if blood alcohol level is equal to legal intoxication level. (Kilgore, 2010)
- When you're sleep deprived, you're also more likely to remember negative details rather than positive ones from the day before: Sleep and be merry! (Kilgore, 2010)

"you should sleep on a problem". "get to bed, you'll feel better in the morning."
-Allan Rechtschaffen, Sleep researcher

Quick Tricks!

- Caffeine increases alertness and attention level, but it does not aid memory retention. Don't depend on your coffee to take the place of your pillow... (Walker, 2010)
- Use smell to your advantage: pick a scent to smell while you study, then have that same scent present while you sleep. This procedure will help memory consolidation and retention.(Born and Wilhelm, 2011)

- Memorize before sleep: the less awake time you have after learning, the less chance there is of interference of that memory. (Gais, Lucas, and Born, 2006)
- Remember, your working memory has a limited capacity. Don't cram everything you need to know at once! Take a nap before moving on!

The Benefits of Napping for a CWRU Freshman

Group 17. Michael Rosenfield, Cara Smith, Liana Manuel, Aaron Smith

According to various research studies and surveys, naps ranging from 6 to 90 minutes are effective methods to increase the overall health and academic performance of a Case Western Reserve University undergraduate freshmen. These benefits occur due to the positive effects that napping has on attention, declarative and procedural memory, alertness, and overall health. Thus, when faced with the choice of napping or struggling through the rest of the day, college students should seriously consider taking a brief nap. This study showed those who napped reported less irritability during the day as well as less aches and pains such as fatigue than non-napper felt; however, non-nappers did report an increased class attendance as well as more alertness in class. Students just need to be careful so as not to nap through classes. Ultra-short naps, which have been proven very effective in multiple studies, can be a solution. These ultra-short naps can last from only six minutes, and have been proven to significantly increase declarative memory and alertness. Short naps can increase alertness for about 2.5 hours. Students can easily find time for these naps, whether between classes or in between studying. The only down side to short naps is that they do not provide any better procedural memory, due to the lack of REM sleep, of which longer naps can help with. Naps between 60-90 minutes have the most effectiveness in consolidation of declarative and procedural memory. Napping after learning also increases relational memory of the material. While it is a good idea to utilize afternoon naps, the duration of the nap and the time of day in which the nap is taken should also be considered. It is important to keep in consideration that long naps can lead to sleep inertia which essentially postpones the benefits one would receive from napping. Other studies have shown that having caffeine in addition to taking a nap can allow for even more alertness. Similar studies show a similar effect is when a person takes a nap and modafinil or another drug to improve alertness. Students who plan on pulling all-nighters on a weekly basis should consider a study on how napping affected night shift workers. The study revealed that taking a nap reported significantly higher scores on reaction time tests as well as vigilance tests than subjects who took no nap at all. In addition, nappers subjectively reported feeling significantly more alert than prior to their nap. Alertness can be nearly doubled if preceded by a full nights rest. However, those who napped reported an increased feeling of fatigue. Therefore, when taking late night naps to increase attention, students should be wary of a lingering sense of tiredness for about an hour or two after the nap's end. Students considering taking naps to improve their alertness and performance should also try to taking naps on a regular basis. Some studies have shown that naps are even more effective for habitual nappers. A well thought out nap schedule can be very effective in increasing academic performance, but napping does not replace a full nights sleep, rather, it augments it.

How to get an “A” by catching Z’s? *

--- A guide to optimal learning for first year students

* Okay, not *only* by catching Z’s, but it will help.

Dear new students at Case,

If your fear of the finals is keeping you awake at night, well, losing sleep only is going to make it worse. Dreams are your friends – and not just because you can be at Hogwarts in your dreams. And here’s what you can do with sleep and the dreams it manifests to learn better through dreaming...

Yours,
Group 14 members

What is dreaming...?

Dreaming refers to the subjective conscious experiences we have during sleep. The experience is vivid, intense, bizarre, and is hard to recall.

What does dreams have to do with learning...?

Both sleeping and dreaming affect knowledge consolidation in the brain. Dreaming occurs for up to 90 minutes in sleep, during which signals of stored segments of experience or episodic memory from the day are randomly fired in the brain. Evidence from computational studies suggests that these firings contribute to learning and memory consolidation. Sleeping contributes to developmental changes in synaptic connectivity, which is related to knowledge storage in the brain.



So what should you do...?

- Sleep well before exams! Sleep deprivation the night after studying eliminates all benefits from studying.
- Don't be on a phone or computer 45 minutes prior to sleep, as bright screen doesn't allow for melatonin production, which helps you fall asleep.
- Bad dreams, or nightmares, can just be a reflection of memory processing, but excessive nightmares are can also be an alarm for your mental health. If you are **haunted by your dreams**, don't hesitate to contact Counseling Services and talk to a professional.
- If you really can't find the time to sleep, day-dreaming can help too! Day-dreaming, or mind wandering, activates similar brain regions as dreaming and contributes to consolidation as well! (Although, sleeping and dreaming works much better)
- Confusing dreams with memories may have serious effects, so when faced with an indistinguishable recollection, try to remember the specific context and perception of the event to help distinguish dream from real events. Keeping a dream journal would also help you keep track of what's dreamt and what's real.

Facts about why sleep is important for college freshmen.

Group 20. Yuanzhe Hu, Amy Shen, Ethan Tucker, Danielle Witri

- Napping can aid in the learning of new facts.

- Sleep benefits both forms of declarative memory, but only if it comes shortly after encoding. Delayed sleep does not help as much.

- Sleep stabilizes newly learned declarative memory, which is shown by its effect on slowing deterioration of memory in the wake period after sleep.

- Getting a good night's sleep can help with learning procedural tasks.

- REM sleep (which occurs at the end of the approx. 90-minute sleep cycle) aids in the encoding and consolidation of both declarative and procedural memories.

- Performance on procedural tasks deteriorates because of repetition. Naps of 30 to 60 min can return performance to a baseline level. Naps of 60 to 90 min can enhance performance of the task beyond baseline levels.

- Memory of semantic-related associates is significantly better than that of unrelated in 12 hour delayed retest depending on sleep or wake condition.

- Sleep significantly improves the likelihood of gaining insight into the solving of a problem.

- The increased likelihood of insight after sleep is extremely likely a result of the consolidation of the memories of the initial experience with the problem.

- Not getting enough sleep paired with irregular and late sleep schedules lead to poor performance in school.

- Going to bed and waking up at the same times on the weekdays as well as the weekends can benefit academic performance.

- Getting enough amount of sleep before tests can improve performance by having memories better consolidated, and keeping them safe from loss.

- More stable bedtime schedules are shown to lead to better sleep quality and feeling well rested.

- Sleep helps more in protection of memory loss from interference than enhancement of memory gain.

- Naps can be nearly as effective as a night's sleep, but there are other factors other than sleep that affects memory and the learning process.

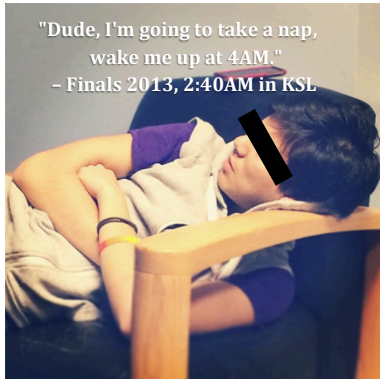
***Facts about why
SLEEP is important
for college freshmen***

Sleep or study?

Group 24. Arianna Wage, Hun Jae Lee, Nitasha Uppal, Aditya Batchu

Sleep or Study?

Insight on the relationship between the amount of sleep and academic performance



Scenario 1:

Andrew sleeps only 2 hours a day during the week and catches up with his sleep during the weekend. How is he doing in class, with this kind of sleep schedule?

Scenario 2:

Joe has finals coming up after this weekend. He didn't really go to classes, and he has piles of Mediavision videos to watch. He plans to not sleep until he is done with finals. Will he be able to do well, or at least, pass his finals?

Human sleep is divided into several stages:

Sleep Stage	Duration
Non-rapid eye movement (NREM)	70-120 minutes long. Multiple stages
Slow wave sleep (SWS) aka deep sleep	Formerly stages 3-4 of NREM sleep
Rapid eye movement (REM)	Approximately every 90 mins

NREM sleep, SWS, and REM sleep all contribute to long term memory systems. **Long term memory** is divided into **declarative** and **procedural** memories.

Declarative memories are associated with **fact-based information**. This includes **episodic memory** (remembering events about your personal life) and **semantic memory** (remembering facts). For the most part, declarative memory is the type of memory associated with what we learn in our classes (e.g. what is a neuron? what is NREM sleep?)

Procedural memories are associated with **knowing how to perform tasks** and are often below our level of conscious awareness. These include **motor, visual, and auditory tasks**, like tying a shoe or reading.

However, the degree to which each of the sleep stages contribute to aspects of declarative and procedural memories vary. So what does each stage of sleep affect?

Memory Type	Sleep Stage responsible
Episodic	SWS, REM, NREM, SWS + REM
Semantic	REM
Motor	NREM, REM
Visual, Auditory	REM, REM + SWS
Cognitive Skills	REM

Overall, **studies on sleep deprivation show negative effects** on cognitive performance, motor function and mood, but more specifically on neurocognitive domains such as **attention** and **working memory**, which are **much more vulnerable to sleep deprivation**. Partial sleep deprivation has effects on attention and vigilance.

Total sleep deprivation inhibits decision-making and long-term memory, as well as impairing attention. Complex cognitive tasks are affected more by sleep deprivation due to the amount of cognitive processes involved in execution.

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The freshman guide to why you should make sleep your best friend

Group 25. Douglas Hermes, Matt Steadman and Katie Kershenbaum

Greetings new student! You have likely heard at some point in your life that sleep is important. College life is commonly described as a triangle consisting of social play, schoolwork and sleep where only two of those things can be had at any one time. The common consensus would show that most students will set aside sleep if it is necessary to finish schoolwork but what if a little more planning around sleep is actually a better decision? Most students here at Case Western Reserve University are not strangers to the concept of an all-nighter and yet forgoing sleep completely before a test is probably one of the worst decisions one could possibly make. We've gathered a selection of research papers to show you how sleep is one of your absolute best friends! Then we realized that these are scary research papers so we've taken the time to boil them down to a short list of scientific facts so you can spend more time doing other things (like sleeping).

Sleeping 101:

- Sleep has an effect across the entire brain, so every brain area is positively influenced by sleep.
- It has been found that new memories can be made while someone is awake but most of that work is done during sleep.
- 8 to 10 hours is the average amount of time for people to get through a complete sleep cycle

- Sleep is divided up into a series of ninety minute periods that shift between slow wave sleep and Rapid eye movement sleep, and each is important for different forms of memory formation.
- REM sleep has been found to be essential in the formation of procedural memories (how to do things) and muscle memory (super important for athletes).
- If you are planning to sleep for longer than an hour, disrupting REM sleep is a bad idea because it removes the benefits it normally gives so try to sleep for complete ninety minute periods.
- SW sleep is marked by low levels of cortisone (the “stress hormone”) and this helps you consolidate factual knowledge (sleeping the night before a test is actually a good idea!)
- In the same way sleep is also great a stress reliever!
- Research has shown that sleeping earlier in the night tends to benefit the recall of factual knowledge while sleeping later in the night helps procedural memory.
- Taking short naps (10 to 15 minutes) can be very beneficial, nap studies have shown that short periods of sleep during the day offer many of the benefits of long term sleep.
- Sleep is not only important for memory it also affects speech production, control of movements, decision making, social adaptation, and emotional regulation.

To break this all down even more, sleep is important! It practically affects us in every conceivable fashion and it is required to maintain a healthy lifestyle. Who knows, it might even help you get an “A” on your first test! Entering college is an exciting experience and there are literally so many different directions you can go but never forget to make some time for sleep.

The Power of Sleep

Group 27: Stephanie Doran, Ava Schneider, Tyler Hamilton, Logan Matt

The Power Of Sleep

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Definitions

Rapid Eye Movement (REM) Sleep: Sleep that has similar neuronal states as the waking brain, and is characterized by rapid movement of the eyes. This stage usually occurs near the end of sleep, and it is the “lightest” stage. One REM cycle is about 90 minutes.

Slow Wave Sleep (SWS): Usually called “deep sleep,” and does not contain any rapid eye movements. SWS has been implicated by many studies in the consolidation of new memories.

Supporting Studies

-For a cognitively procedural typing task, a 90-minute nap showed 16% improvement, and in a finger-thumb touching task, sleep deprivation (SWS and REM) the night after training in the task decreases improvement over 75%.⁷

-Performance improvement was positively correlated with amount of sleep, after six hours of sleep. The SWS in the first quarter of sleep and REM in the the last quarter of sleep were positively correlated with improved performance if participants got both SWS and REM sleep.⁸

-Learning is dependent on the neural processes that occur during sleep. Consolidation is a two step process, with the first step occurring during SWS and the second during REM.⁸

Sleeping Strategies to Survive College

- If you have to cram, take naps (preferably 90 minutes) in-between learning chunks of material.⁷
- Make sure your sleep schedule allows for the completion of REM cycles, this can be done by sleeping in multiples of three hours.
- Waking up at the end of REM cycle is preferred, and students feel more refreshed and able to learn that day, cognitive functions are not hampered.
- For optimal performance, declarative memories, such as vocabulary words, should be studied in the afternoon and motor skills, like playing soccer or piano, should be trained in the late evening.³
- Reviewing material in-between sleeping sessions further strengthens the memory and leads to stronger consolidation of the information

Optimal Sleep for Learning

- REM intensity and density is important. Students should sleep in complete REM cycles so as not to disrupt consolidation; this also ensures SWS.⁴
- 90-minute naps after learning new material improves consolidation.⁴
- A complete cycle of sleep is critical for consolidation and improves stimuli processing.
- Sleep is important for abstraction of generality evident with even a brief period of daytime napping.⁴
- Declarative memory (facts and knowledge) is significantly improved by sleep, compared to sleep deprivation.³

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Sleep

Group 30. Ian McCurdy, Sharon Liu, Andy Liang, and Morgan Williams

There is probably a lot of stigma about sleeping an actually healthy amount of time. There's an attitude on college campuses about how it's okay to pull all-nighters--sometimes even several in a row, drink sickening amounts of energy drinks and caffeine, and our personal favorite...falling asleep in class! THIS IS NOT OKAY!! While, yes, professors give out a %#!% ton of homework, it is important to get a healthy amount of sleep (7-9 hours a night). We know it is difficult to do so and that there are going to be nights when it is simply impossible to not sacrifice sleep in favor of getting that paper done or studying for an exam that you completely forgot about. We understand. And it's okay to do be sleep deprived every now and then, but there are scientifically valid reasons as to why you should not deprive yourself of sleep every night or even most nights.

A study using mice proved that paradoxical sleep deprivation, which is being sleep deprived for 72 hours or more, was state-dependent. This basically means that you must be sleep deprived during an exam if you learned the material while sleep deprived as well. Or if you drink caffeine while studying, you should also be caffeinated up during the exam. If you're always sleep deprived while studying, you should be sleep deprived during the exam and this could lead to a downward spiral of being constantly sleep deprived. However, chronic sleep deprivation--even if based in state-dependent learning--does not lead to good results. There is a study about how chronic sleep deprivation and getting 6 hours or less sleep on most nights ends with students displaying inattentive behaviors in class, as well as an inability to learn and perform well on tasks that tested knowledge they learned while sleep deprived.

Another study was completed to test the effect of sleep on episodic memory based on the age of the participant. The background for the study is based on the degradation of Slow Wave Sleep (SWS) with aging. SWS is responsible for helping memory consolidation and, as found in a separate study, can help to enhance encoding after sleep. The study showed that personal stories were more memorable after sleep for younger people than for older people. This shows that while one is young, as freshmen in college are, sleep plays a big role in the recollection of past experiences, such as lectures. Rapid eye movement (REM) Sleep was found to play a bigger role, in another study, in the consolidation of declarative memory in patients with insomnia, than SWS. Either way, sleep prior to an exam will assist in the recall of lecture material and lead to improved performance.

Some researchers discussed the benefits of sleep on not only memory, but also stress and anxiety. They noted that different amounts of sleep deprivation could have different effects. Sleep deprivation ranging from 12-24 hours led to a sort of manic phase where a person or animal seems to have less anxiety, but note that this lack of sleep does catch up with you; any more than this leads to anxiety, irritability, and a decreased ability to concentrate as well as disturbances in memory, learning, and emotion. Sleep deprivation can also decrease your attention and reaction time and impair your judgment. Another study found that the consolidation of fear memory is related to the time spent in REM sleep, with the more you get, the better you remember it. However, you also remember how to avoid being in such a situation again, rather than having a vague memory of what had happened. So the next time you think about putting off sleep to work on a project you should have started hours ago, remember this stuff.