Episode 03: Attention, Please! The Role of Attention in Playing Games

Show Notes

You need to have focused attention while playing games. If you don't, you might miss a critical move in a board game, or totally miss that other player about to blast you in Call of Duty. This episode considers how attention works as we play games.

Game References

Captain Sonar, Horizon Zero Dawn, Pandemic Legacy, Stroop

Research References

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Simons and Chabris Visual Attention Demo

Simons and Levin Visual Attention Demo

Change Blindness Demo

Transcript

Hello! This is episode three of Cognitive Gamer. I am your host, Steve Blessing. In this episode we are switching gears a bit from talking about memory, and will consider what role attention has while playing games.

One of the earliest psychologists, William James, wrote one of the first psychology textbooks way back in 1890, titled The Principles of Psychology. In the text, he deals with attention, and starts with a very famous quote. He writes, quote, "Everyone knows what attention is," endquote. I imagine that's true. It's a word that we all use, as in, "I'm sorry I missed it, I wasn't paying attention." Or as in "I need to attend to this, it's important!" In psychology that's both a

blessing and a curse. Because psychology is the study of human thought and behavior, and we are all human, we all feel like we have a lot of insight into the subject matter of psychology. That's true to some extent, but a science needs to approach its subject matter a bit more rigorously than that. And that's why, even way back in 1890 when William James wrote his textbook, and even though everyone knew what attention was, he went on to define it, like a good scientist. Here's what he said: quote "It [attention] is taking possession of the mind, in clear and vivid form, of one out of what seems several simultaneously possible objects or trains of thought. Focalization, concentration of consciousness are of its essence. It implies a withdrawal from some things in order to deal effectively with others," end quote.

My family is currently playing through Pandemic Legacy. In each game there's a lot of things to attend to, from the cities that are being infected, to the cards that are in your hand and everyone else's, to the different abilities that each of the characters can do; it's a lot to keep up with. To make things manageable, we often just focus on one or two things, like curing the red disease or getting a research station built where we need it. That is, we give possession to our attention to just those things, just like William James said. But, again like James said, that means that other things will withdraw from our consciousness. And when that happens, that's often when disaster strikes; an area we weren't thinking about will have an outbreak, and that might lead us down a path to where we lose the game.

That can happen in any board game, video game, game of chance, or sports game for that matter. When we take our eye off the ball, either figuratively or literally, that's when we will miss a play. We've probably also experienced playing a game that we are really into playing, making moves and attending to what needs to be done, but the other player just isn't in it. Their eyes are darting to the TV, or to their phone; they just aren't paying attention to the game, and that makes it less fun for us. That's the bottom line here; we only have so much attention. What we can consciously be aware of and processing in our mind, is precious little. We have to make a choice; do we attend to the game or to the phone? We can't really do both.

I'm going to talk about a short video demo that some of you might have seen. I will link to it in the show notes so you can check it out if you want. It's a visual attention demo done by Daniel Simons, a famous researcher in the field, and Christopher Chabris. I'm going to go ahead and spoil it here, so that we can talk about visual attention. The video shows 3 people with white shirts and 3 people with black shirts. The white shirted people are passing a basketball back and forth, as are the black shirted people. Your job in the demo is to count the number of times a white shirted person throws the ball to another white shirted person. The video is only about 30 seconds, and they pass the ball 12 times. But, that's not the big question it turns out. The big question is if you saw the gorilla in the video. And, the gorilla is pretty obvious; it walks right across the middle of the screen. The data show, and I've seen this in my classes many times, that if you don't know about the gorilla, there's only a 50/50 shot you'll see the gorilla. The explanation is simple: you are paying attention to white shirted people, and the gorilla is dark; half the people simply don't see it, and are totally surprised when it's pointed out. I'm sure this has happened to you when playing a video game, that you get so focused in on some aspect of

the game, that you are totally blindsided when something attacks you or some other emergency happens.

Most of what I'll be talking about here is visual attention; what are we taking in through our eyes and what can we attend to? We know a fair bit about how that happens. Have you ever looked at someone's eyes as they read a book? If you have, you probably noticed that their eyes will make a quick movement, pause, make another quick movement, pause, and continue as they scan across the page. Those quick movements are referred to as saccades and the pauses are fixations. The important thing to note is that the eyes have to move in order for us to properly attend to the words on the page. We can't keep our eyes steady and efficiently read the book. This is because that in order for us to fully take information in visually, we pretty much have to be looking directly at it. True, each eye has substantially more than 100 degrees of visual angle that it can see. But, there's a part of the eye called the fovea, the very center part, where there are only cones, no rods. Because of how they are wired to the brain, the cones do our detailed vision, and in order to read words on a page, or to identify a face, or to do anything else that requires seeing the detail, the image needs to be striking this part of the eye, the fovea. The fovea is only about 2 degrees of visual angle, a very small amount in comparison to all that that the eye can see. To get a sense of what 2 degrees of visual angle is, extend your arm out and raise your thumb. The width of your thumb at arm's length is about 2 degrees of visual angle. That's it. That's why your eye makes all these quick movements as it scans a line of text. That's why we can easily miss things that happen outside of our foveal vision, even obvious things like a gorilla walking across the screen. I don't want to say that our feeling that we have at least some idea of what's happening in our peripheral vision is an illusion, there is such a thing as covert attention, but our ability to attend to things outside of the center part of our vision is limited. As William James stated over 100 years ago, we have many possible things that can grab our mind's focus, but we focus on just a small number, perhaps just a single thing, like white shirted people throwing a basketball around.

The psychological name for not noticing the gorilla as it walks across the screen is inattentional blindness. That is, it's the inability to attend to unexpected stimuli. A related phenomenon is called change blindness, or the inability to attend to obvious changes outside of your foveal vision. This is why continuity errors in movies are almost never noticed, even very obvious ones, until they are explicitly pointed out. We probably all know at least some, such as the one in Pretty Woman where a croissant seemingly becomes a pancake, and then that pancake has two second bites taken out of it as the camera cuts between Julia Roberts and Richard Gere. All movies have these sorts of mistakes, with food scenes and scenes with clocks being notoriously difficult to edit together. If you pay attention to the food or clock, and not the actor, you will notice food that has been eaten re-appearing back on the table or time going forwards and backwards in odd jumps. But, almost all of these go unnoticed, because we are not paying attention to those unimportant parts of the scene, but instead are concentrating on the actor's faces or the relevant actions they are doing.

Another classic attention demo has been done by Daniel Simons, the researcher who did the gorilla video, and Daniel Levin. This one involves people asking for directions. A confederate of

the experimenter goes up to a person and asks for directions, while pointing to a map. As the person is providing the directions, more confederates come by while a carrying a door, passing between the first confederate and the person giving directions. While the obstacle is between the two people, a swap occurs. The first confederate is swapped for an entirely different person! The question is, does the direction giver notice the change? In a majority of cases, they don't. Their attention is quickly drawn to the map, and so don't notice the switcheroo. Even large changes between people, like swapping a man for a woman, or a dark skinned person for a light skinned person will go unnoticed. In addition to the gorilla video, I'll also put a link to a video demonstrating this experiment in action. And, for good measure, I'll put the link to a cool set of demos that illustrate change blindness in an experimental way, where you will have to indicate where the change occurs between two almost identical pictures as they are swapped on the screen. This demo is nice because you can change the different variables that affect the probability and speed of noticing the change, such as time that each picture is up and the timing between the switch.

Inattentional blindness and change blindness both occur when we play games. How often have you played a game, particularly one you are not familiar with, and you are focusing on moving or manipulating the thing that you control. As you are doing that, other things are happening on the screen, but we are oblivious to what exactly those changes are, often to the detriment to our onscreen avatar. This is just our psychology at work.

There have been some number of metaphors to explain how attention works, such as attention as the glue that holds our perceptual features together, or attention as a spotlight, that can be shown wide in order to see a lot of things in a little detail, or narrowed to a small circle in order to really pick out the detail in a small area. Those might be topics for a later podcast, but for our last bit here, I would like for us to consider the capacity theory of attention. This theory considers attention as a resource pool that we have access to, and anything that requires our attention draws resources from this pool. As long as we still have attentional capacity left, we can attend to the item, to at least some degree. But, once those attentional resources are gone, we can't attend to anything more. Many things affect how much attention a particular task may require. For example, some tasks are just more complicated than others, and so require more attention. Also, the more you practice a task the less resources it will require.

Let's consider a task that probably most of you do on a daily basis, driving. In fact, some of you might be doing it right now! I've been driving for about 30 years now, and so have a lot of practice at it. It doesn't require a lot of my attentional resources. That means I have attentional capacity left over to do such things like adjust the radio, carry on a conversation, or listen to a podcast. However, I can think back to when I was first learning how to drive a car, and remember that driving required a lot of attentional resources, so that I couldn't do some of those other tasks. With more practice, the less attention I needed to pay. Driving is an interesting task, in that the complexity can change based on conditions. Highway driving is simpler than city driving. When I'm in a new city and trying to navigate, the radio gets turned off, and I can't concentrate on a conversation or a podcast, because all my attentional capacity is required for the driving task. Any activity that we do has this draw on our attentional

resources. Some activities will take up most of our attention, like solving a math problem for most of us, but some require very little, like a person who has been knitting for years on end, being able to knit and carry on a conversation.

A classic experimental finding in psychology examines what happens when two tasks compete for your attentional resources. And actually, I just saw on boardgamegeek.com that Jonathan Chaffer has made a game out of it. It's called the Stroop task, and that's the name of the game as well. The original paper, written by J. Ridley Stroop, goes back all the way to 1935. In the task, participants were shown words for color names, like red, green, and blue, and had to do one of two very simple tasks: either read the word or name the color of ink the word was written in. Either task is simple in the consistent version of the task when you had the word green in green ink. Either task was done quickly. The task was more difficult when the word green though was written in red ink, or what we might call the inconsistent version of the task. Here, reading words was done in about the same amount of time as before, but trying to name the ink color "red" when the word is actually green turns out to be challenging, and the people were significantly slower in that condition.

That's what happens when you try to do two tasks at once, and there's a mismatch between the tasks. The more well-practiced task will win out, partly because it requires less attentional resources. Adults can name ink colors just fine, but we have so much more practice reading words over naming ink colors that we cannot help but to read the words. So, when there's the mismatch between ink color and word, it takes an extra beat or two to suppress reading the word out loud and instead say the ink color. I don't know if this is true, but I have heard the CIA used the Stroop task to find suspected spies. They would show the inconsistent version of the task to someone they thought might be a spy. The Russian word for red would be in green ink. It was also written in their Cyrillic alphabet. If the suspect had a lot of experience reading Russian, they would get tripped up naming ink colors. Someone who had no practice or experience reading Cyrillic would be just as fast naming ink colors in the consistent and inconsistent version of the task because they couldn't read the words. I don't know if the CIA really did this, but it would work. A lot of research has been done on the Stroop task, not just this version but tons of different variations. If you gain more practice on the less-rehearsed task, the difference between the consistent and inconsistent versions of the task lessen. In general, people are usually pretty bad at doing two or more tasks at once, and almost always one or both tasks will take a hit when we attempt to multitask.

I've thought a lot about these issues involving attention lately as I've been playing Horizon Zero Dawn. I'm about 20 hours into it, and really enjoying it. I'm a bit of a completionist, and so I think I'm maybe half done at this point. I'm really liking the world and the story. I feel pretty accomplished at this point, and feel like I can get Aloy to do the things I want her to do. But at first, I was overwhelmed. The interface is nice, but I felt there was too much stuff to look at. There's your health in the upper left, along with the current quest, the compass in the upper middle, then your current experience points in the upper right. In the bottom you have the reminders about what the directional buttons do in the lower left, and information about your weapon the lower right. Plus, there's all this information overlaid on the main screen, like the

icon for the distance to your current target and the location of resource items to gather. I didn't know where to look! In addition to just knowing visually where to look, there's all the menus and additional information you can access, like the crafting and skill tree menu. It took up more than all the attentional resources I had. But, I stuck it out, and now with all the practice, I can look at all the displays and fully understand all the information on the screen quickly. It requires much less of my attention to play the game, and I'm a much better because of that fact. If you have ever watched eSport athletes play, you will notice they can flick back and forth between screens quickly, because they can attend to the information they need rapidly, given all their practice.

That's the same thing my family is finding with Pandemic Legacy, that we can better attend to what we need to while we play the game. But, with the game changing through each play of it, new rules and items are introduced, so that keeps our attention on it toes. And, that is why that game is so fun and interesting. You never get to the point where you are so well-practiced at it that you can essentially go on auto-pilot, like maybe you could with a match-3 game or a task like highway driving. You need to engage fully with each play of Pandemic Legacy in order to meet the objectives, and a lot of us find that satisfying.

Oh, one more game to mention before we go. Captain Sonar is a board game that is played in real-time. Two teams of four operate a submarine, trying to torpedo the other one out of the water. Each member of a team has a different role. One role is the radio operator, who has to listen to the other team as they make moves, in order to try to figure out where on the map they may be. It takes coordination between the team members in order to play the game, with everyone having to pay attention to different aspects of the game in order to do their job well. When the game is in full swing, it's a lot a fun, at least a little tense, and a great example of how people can attend, or not attend, to what is going on around them.

Okay, that wraps up another episode of the Cognitive Gamer podcast. I hope you have enjoyed it and learned something about how your mind processes visual information, how we attend to items in our visual field, and how that works out whenever we play games. In the next podcast I'm going to get a little philosophical and discuss computer programs that play games, and what that says about human intelligence. Between now and then, if you have any questions or comments, please email me at steve@cognitivegamer.com. I would love to hear from you, and if you have a question, I may answer it in a later podcast. Also, be sure to like my facebook page, Cognitive Gamer, and to visit the website cognitivegamer.com. You can also hit me up on Twitter, at cognitive underscore gamer. Until next time, remember to think about what you play, and have fun doing it.