The Optimistic Rat with Dr. Travis Hodges

Nerdin' About Podcast Transcript, Season 1 Episode 15

Michael
Hey everyone welcome to Nerdin' About! I'm Space Michael, and with me as always, is someone who as she gets ready for Halloween, is probably going to be dressing up as perhaps Splinter, the leader of the Teenage Mutant Ninja Turtles, and that would be Dr. Kaylee Byers.

Kaylee
Oh, that's so funny that you mentioned that because our previous guest Sultan use to call me "Oh wise Splinter". So, that's actually someone that I have wanted to go as for Halloween for quite some time.

Michael
I think it's time.

Kaylee
Did you dress up much when you were a kiddo?

Michael
Oh, yeah, absolutely. My favorite one was Sherlock Holmes. So, my Grandma she took two baseball caps, and sewed them together to make that double brim, and then she put a fabric over top of it. Then I had like this suit, and I had a pipe that was made out of licorice. I was a very dorky kid.

Kaylee
Well, that sounds pretty fantastic. I would like it if you would also go now as an adult as some rat-themed character, because today oh my gosh joy of joys we're chatting with Dr. Travis Hodges. Travis is a neuroscientist, and postdoctoral fellow at the Centre for Brain Health at UBC, where he studies pessimism and optimism in rats. Travis, thanks for making the time for us on a weekend.

Travis
I have to say great, costume choices for Halloween. I haven't even thought of Halloween this year at all. But in the past, I've loved dressing up for Halloween.

Kaylee
Did you have a favourite costume?

Travis
One of my favourites, and this isn't a plug or anything, is on Netflix. Their TV show Merlin is on there. I love Merlin, even though it starts off pretty rocky in terms of special effects, and it

continues to be rocky throughout, but I love it very much. I dressed up as one of the characters off of Merlin, and it was probably one of my best costumes.

Kaylee
That sounds amazing. So, you know, we're reminiscing a little bit about some of our earlier nerding out. I mean, everyone should have known that we were all going to grow up to be huge nerds. So, Travis today you are still a nerd, but you're a nerd neuroscientist whose work is focused on brain development, and behavior in those early years of life when we're all dressing up. So why does this timeframe of development interest you?

Travis
So, a lot of it came from when I did my masters, and my PhD with Dr. Cheryl McCormick at Brock University. Her lab has a lot to do with social stress in adolescence, and of course, social stress in adolescent rats was my major project. At Nerd Nite when I gave a talk, I talked about how social stress in adolescence led to social awkwardness in rats, and how I study social awkwardness in rats, and what brain regions were involved in social awkwardness in rats. So, I had to do a lot of research that involved comparing different age groups, and what I was finding is social stress, in particular, adolescent rats are more susceptible to social stress. Whereas there are other stressors that adults are more susceptible to, and other stressors that both age groups are equally susceptible to. So, I gained an interest in these different effects that occur depending on what age group you're studying. Those effects also change depending on the sex of the animal you're studying. So, adolescent males versus females, there are differences versus adult males and females. I just like to incorporate looking at sex and age differences in all of the studies now based on that fact.

Kaylee
So, which of those rats on the whole ends up being the most awkward?

Travis
Oh, well, normally, when we're looking at the sex differences in them, the males and females were both equally awkward due to social stress in adolescence. So, they kind of gained that awkwardness. I didn't get to do too much longitudinal studies with the females, but with the males that social awkwardness lasts and lasts and lasts [laughs] into later adulthood, and it then compromises their ability to interact with individual other rats of the same age for a long, long period of time when they get older. So definitely in males, it affects our social awkwardness quite a bit.

Kaylee
So that's really interesting. I want to ask one more question about social awkwardness. What does a socially awkward rat look like? Like if you're looking at what they're doing, what characteristics are you like, “that is awkward”.

Travis
So, it was actually not supposed to be the basis of my study, I was looking at social stress, but I did not know that I was going to find that these rats, when you try to make them interact with each other physically, they would not be able to interact physically with each other. But if you were to put up a safety net of some kind, like a wire mesh between them, they would interact a lot with each other, between the wire net. So, it's like, they're able to interact when they know that they are feeling safe. Like humans say behind like a computer screen, or something of the sort, they will interact quite a bit. But when it comes to actual physical interactions, they are not able to perform the correct interactions with their peers, and that lasts all the way up into adulthood.

Michael
So, Travis, right now you're studying pessimistic and optimistic thinking in rats. Could you tell us first what pessimistic and optimistic thinking are?

Travis
So, I made the transition from social awkwardness in rats to optimism and pessimism in rats, in a way. Pessimistic and optimistic thinking, what I am studying is cognitive biases. So, whether someone is more positively cognitively biased, or more negatively cognitively biased. A lot of this is tied to say a phrase, like an example that I use all the time is, if somebody were to say, "that is an interesting shirt you have on", say, on the street, or from a friend. Some people would take that in a positive way, which is normally me, I have a very strong positive cognitive bias. I don't know why, I always blame my Mom, because she smiles all the time, and is very happy. Other people have been finding that people with depression, or anxiety disorders would take this kind of phrase as more negative on average, compared to control groups that are not depressed, or having anxiety disorders. So, what this research is looking at is this pessimistic-like behavior, it's found to predict whether or not people are going to have depressive-like symptoms in the future, and it is a major symptom of depression. We're trying to find a way to reduce that symptom of depression, to kind of prevent future depressive episodes.

Michael
I am remembering now as a kid being really worried when people would say, "Michael, that's... interesting", you know it's way saying, “you're kind of a little bit off the rails here”. I think I've leaned into that now, and when people say that I'm like "yeah, it is interesting. I am weird." So, Travis, you studied awkwardness in rats with the wire meshes. So how do you study pessimism and optimism with rats?

Travis
Yeah, so a lot of these studies involve training the rats to find a certain context or a situation as positive, for them to recognize that that situation is positive, and then training them to define another context that looks different from that first one as negative, then giving them a context that's a mix between the two, and seeing do they respond like they are in the negative context? Do they respond like they're in the positive context? Do they automatically think everything is

fine? Do they automatically think everything is horrible, and this is going to end horribly? So, when it comes to even my research, my negative context, it involves things like differences in lighting, so it'll be less lighting, differences in the patterns of shapes and things on the walls, but the negative context also involves a mild foot shock. So, they do not like a mild foot shock, and what they would normally do in response to that is freeze in anticipation of that foot shock, because they do not want to be taken aback by being foot shocked. Whereas in my positive context, there is no foot shock, they go into that context, and they explore everything because they love exploration, and they will explore the whole entire context. Then I will give them a context that's a mix between the two, and some of the rats will freeze automatically into that context, that's not linked to any foot shock at all, but looks a little bit like the foot shock one, or the positive one. Other rats will remain very positive, and just run around in circles, and explore every inch of the place, because they do not fear that anything wrong is going to occur. I find sex and age differences, and how they respond to that.

Kaylee
It's really interesting. As someone who has trapped over 700 rats, all I can do is think about the trapping scenario we would put out which I always interpreted as negative, but then they also get delicious peanut butter oat balls. So maybe it's a mix, you know, maybe they're interacting with this mixed environment.

Travis
It could be a bit positive. Yeah, I mean, based on where you take them, how long they are in that enclosed space, because they would probably prefer not to be in that enclosed space. If there's food involved, they love food, I've done another cognitive bias task with my rats that involved Cheerios, it was a smooth ground that they would walk on, and if they walk on the smooth ground, to the left, there would be a large reward of Cheerios, and if the ground was coarser, and it to the right, there would be barely any Cheerios.

Michael
Is this like Tony Robbins? [laughs]

Travis
You know, this is what I do in my spare time, and I really love that study, too. Then I would give them a flooring that's kind of between the two, and see if they would go left or right, and would they anticipate that there's going to be a large reward, or a smaller reward. We found that some rats automatically think there's going to be something great coming, and some rats automatically think there's nothing that's going to be there. In the apparatus that I had, they'd have to wait in a spot before I would open up the frame so they could run out and either choose left or right. They would be running, trying to get through to get to the Cheerios before I would even begin the task. So, they love Cheerios, and it was Honey Nut Cheerios, by the way.

Kaylee
Delightful! Rats after my own heart.

Travis
A little bit of sugar in there they love.

Kaylee
So, Travis, earlier you mentioned that you were looking at optimism and pessimism in rats, and that you were finding some differences from age and sex. So, can you tell us a little bit about what you found so far? And the characteristics that make rats more likely to think negatively or positively?

Travis
Yes, of course, this is the fun part that I've been thinking about, all this time, especially in COVID-19. So, I studied these rats, males versus females, as well as rats that were adolescents versus rats that were in young adulthood, versus rats that were in middle age. I was finding that in adolescents, both males and females are very, very, very positive, extremely positive, the most positive. [laughs] They have strong, positive cognitive bias, there is barely any negativity at all, then when it comes to young adulthood, they get very negative. They have a negative cognitive bias that occurs there, and then when it comes to middle age, the males continue to get even more negative, whereas the females returned to being as positive as they were in adolescence.

Michael
Well, Travis, this is concerning to me specifically, because this weekend, I'm turning 43. And I'm wondering, am I in danger here? Like your study is showing that males pessimism seems to be increasing, so am I just going to become the Simpsons headline, "Grandpa, old man yells at cloud?" Like, what does your research show for beyond that? Is there hope for me?

Travis
So, I have been thinking about the same exact thing. Since finding the research finding multiple times, and reading the human literature, which also finds that an increased negative cognitive bias with age, especially in males, in humans, as well. So, I've been thinking about this a lot. There are always exceptions to the rule, even in my groups, whereas the adolescents are very, very positive. There are a couple of adolescents that are negative in that group.

Kaylee
Realists. Those are the realist rats.

Travis
Yes, and they're all the same age, and they have all had very similar experiences. So, for some reason, those couple of rats are a little bit more negative than the rest. I'm also very interested in why that's the case. Same thing with the young adult group, there are some rats that are

more negative, and some of them are positive. In the middle-aged males, there's so many that are negative that that kind of washes over the few positive ones that might exist, but there is always one or two that still remain optimistic in middle age, whereas the others all go down. You could be that exception to the rule. Especially if you take all the positivity in, and all the negative stressors that are around you, especially in COVID-19 times all this negative stress. If it doesn't affect you as much, it should not lead to an increase in negative cognitive bias in you in particular.

Kaylee
Michael, you can be the outlier that drives all scientists bonkers when they try to analyze the data.

Travis
But it's the outliers that we love, because we get to figure out why this happened.

Michael
Well, it is interesting, and I do think about it a lot, because in my job, and in my public science communication, I do try to be an optimist when it comes to the future, but at the same time, I still have moments within myself where I need to express some pessimism, and if I'm not doing it publicly, then maybe I need to do it with my friends in a safe space.

Travis
I feel the exact same way. I like having a positive cognitive bias, I would like to remain that way as much as I can, it's always good to have a little bit of pessimism to everything happening. You just don't want to fall into an area where everything that comes at you, you see as negative, and that would definitely put you on a trajectory towards having maybe a depressive symptom coming along the way. Definitely have to watch out for that, but a little bit of negativity, a little bit of positivity, I think is fine.

Michael
So, Travis a paper that you sent us talked about interpretive bias of ambiguous facial expressions in older adults with depressive symptoms. So, basically what this paper is saying was that older people that were depressed were interpreting facial expressions to be negative. This got me thinking about emojis, and how we use emojis a lot in our communication when we're texting, and they are also open to interpretation. Like one I use a lot is the eyes XXed out, and I'm not even too sure what exactly that emoji is supposed to mean. I use it a lot to be like, "Whoa, that's crazy."

Kaylee
Really? I use that when talking about how my thesis was killing me.

Travis
Well, there's now the kind of thing where I would say, in terms of if something is very, very funny, I would say "I'm dead" or something of the sort, and put the little skull and crossbones, or the XX eyes, and that's to be a positive thing. So, there is those differences.

Michael
So is there any connection to the research that you're doing with emojis as it is, you know, a digital interpretation of a facial expression.

Travis
So definitely in the studies that involve facial expressions. They've been done in the study that I sent you in older adults, they've been done in adolescents as well, and in young adults. I mean, they're a great way to determine whether someone has a more negative or positive cognitive bias, because some people do see a slight smile on a facial expression as something either sad, or a twisted kind of complexion. Whereas others find it "Oh, it's just a positive, nice little smile that they have", and that can tell you different things about the individual differences about that person. When it comes to emojis, if we were to do a study in which they had emojis to choose from, there are a lot of biases that come depending on the situation that those emojis are found in, which could wash away the results in a way we'd have to somehow control for: How do people normally use these emojis; whether or not they use them in a more positive way or negative way, because that would result in biasing the results towards what we think is a negative emoji as more negative and what we think it's a positive emoji. Maybe it's more positive or more negative, depending on how they use it normally, in their life in their daily life. But it could be done, we could do an emoji study.

Kaylee
So, Travis, bringing everything together. One of the things is we're working on rats, and you're talking about some similarities in people having similar experiences. Of course, we're working with different organisms. What do you think are the big implications of your work? Where would you like to see this work go?

Travis
So, at the moment, there is barely anything out there on negative cognitive bias, well, what brain regions are involved in negative cognitive bias. What they've been finding is even in those with remiss depression, so those that had depression, now do not have depression, they still carry a negative cognitive bias way after they had those depressive symptoms. Carrying that negative cognitive bias can then result into more depressive symptoms that can predict when they're going to have depressive symptoms coming back later on. So, we haven't found a way to really reduce that negative cognitive bias in the long term, and we're trying to figure out, to start what mechanisms are involved in that negative cognitive bias so we can then reduce that negative cognitive bias, and see what parallels we can make with the human literature, and see if we can then use the same kind of treatments to reduce negative cognitive bias in humans as well, and

then prevent future depression from occurring. That's the main goal of my research, and to throw in the age and sex differences in there is to find a treatment that's very specific to a certain sex or a certain age group, because that can differ depending on how the brain has changed from across the lifespan or depending on sex.

Kaylee
Are there areas of the brain that have been found so far that are particularly affected by cognitive bias or the ones controlling cognitive bias?

Travis
Yes, yes. Yeah, great question. What we've been finding is two brain regions, the basal amygdala, and the ventral hippocampus, and both of these brain regions working together, the connectivity between them has been found to be involved in anxiety and in to depressive-like symptoms and behaviors. Activating them can result in increased depressive-like symptoms, or reduced depressive-like symptoms, depending on how old the rats are, and what sex the rats are. We're finding a similar thing depending on age and sex, whether or not these two regions are activated at the same time will result in a more positive cognitive bias, versus a more negative cognitive bias. So, we are zooming in now since we found quite a bit of data to support this on those two regions to figure out what is it about those two regions besides just how active they are. So, what other roles of the neural system that play into cognitive bias based on those two brain regions. So, we're focusing in on the amygdala and the hippocampus for sure when it comes to cognitive biases.

Michael
Should we let the Nerd Herd ask some questions?

Kaylee
Oh, yeah, I've probably asked enough, we can let them ask some.

Michael
So, if you want to get in on the Nerd Herd questions, make sure to follow us on our socials @NerdNiteYVR, on Twitter, Instagram, and Facebook. Our first question comes from previous guest, A.J., who asks, "What impact does toxic positivity have on the brain?"

Travis
Yes, I saw this question on the Instagram, which was great, very interesting question. I have a little bit of data to speak to this coming from my adolescent group, my adolescent rats. Which I thought, going into the task, since the task involved a mild foot shock, I at first thought that none of the rats were going to display a positive cognitive bias. I thought they were all going to be negative, because the contexts are so similar. They look very much alike that I thought they would never be fooled into thinking that the mixed context had nothing to do with the previous context paired with the foot shock. Boy was I wrong, those adolescents, even though they

experienced that one context paired with the foot shock multiple days, they went into this new context thinking, everything's great, they would run around, and nothing was wrong. They had no freezing behavior at all. They're just running in circles, sniffing everything, licking everything, and just acting like everything is fine.

Kaylee
Living the dream!

Travis
Living the dream, which I don't know if it's a dream. It's definitely something that occurs in adolescents, in that they are a bit riskier, and they didn't quite take in that negativity like the older rats did. Whether or not that's a good or a bad thing. This could lead to trying new things in adolescence, which is a great thing to do, and a great time to do it before a lot of the cons of adulthood come into play, great to try new things in adolescence. But increased risky behavior can also lead to a lot of bad experiences, say that if they went into this new context, thought everything was fine, and it wasn't, it could result in negative occurrences later on. So, it's always good to have a little bit of positivity, but not pure positive cognitive bias in all situations you find yourself in. You're going to think this is going to be great no matter what, and not even look around to see if there's something negative that's going to occur.

Kaylee
Okay, and we have another question. So, this next question relates to sleep. So, for everyone listening if you haven't listened to our episode with sleep researcher Rackeb Tesfaye in Episode 13, you should go back and have a listen to that. But Russ asks, "What role does sleep play in allowing the brain to better process positivity or negativity?"

Travis
Yes, and I did listen to that episode with Rackeb, and I found of very interesting. So, I haven't looked at sleep in the study specifically. In humans, poor sleep quality does result in increased negative cognitive bias. So, there is a tie there, and that resulting negative cognitive bias can then be linked to future depressive episodes that occur later on. Whether or not they go in one way, versus the depressive episodes resulting in then a negative cognitive bias is still unclear. It would be very interesting to look, especially in my animals, to see what their sleep quality is like. Rats' sleep quality is very different from human sleep quality, in that they sleep during the light cycle for one, but also during that light cycle, they are waking up every 10 to 50 minutes to eat, do things, and then go back to sleep. They have micro sleeps that they keep going back and forth into. All of these rats that I've worked with for the study should have disrupted sleep, because all the studies were conducted during the light cycle for multiple days in a row. So, it would be interesting to see if their sleep quality in addition to me taking them to that apparatus to do the procedures, whether the sleep quality is also affected when they go back home to their home cage with their cage partner that they're with, and if that has a correlation with how negative they are. But I will say that all the rats went through the same exact procedure, and the

adolescents even with their lack of sleep are still super positive. So, it doesn't seem to be doing much to those adolescent rats even if it has an effect on the negative cognitive biases.

Michael
You want to nerd out?

Kaylee
I would love to nerd out. Travis, you want to nerd out?

Travis
Yes, for sure!

Michael
So, if you want to get in on the nerd outs, get us on our socials @NerdNiteYVR on Twitter, Facebook and Instagram, or you can even email us vancouver@nerdnite.com, and our first nerd out came from Albert, who is nerding out about epidemiology. Now, Travis, you know we're in this COVID time. Are you optimistic or pessimistic that people are learning more about epidemiology in this time while we're all dealing with something collectively right now?

Travis
COVID-19 has been a test of positivity for sure. A lot more negative bias coming into play. I feel like that's probably true for a lot of people. A lot of people are probably experiencing depressive episodes for the very first time during COVID-19, and so very important to look at this.

Michael
What are you nerding out about Travis?

Travis
Oh well, a bunch of things. I love bad movies. I've said this on my Twitter, and said this everywhere. I love bad movies a lot. Cats, is amazing with friends. Do not watch it alone. All of you out there, please watch it with friends. It is a great experience, but with a friend. Also because of the time that we're in, close to Halloween times. I do have some nerd out horror things, that I love to watch around this time that involve Netflix shows such as the Haunting of Hill House, which I really love, I've watched the Haunting of Bly Manor.

Kaylee
So good!

Travis
So definitely catch that. A third one is a TV show called Marianne that came out last year, a horror TV show, which the last episode of that show has imagery that will stay with me forever.

If you want something horror-based that is also kind of a fun ride, Marianne is a good show to check out.

Kaylee
Very cool. I actually also really liked both Haunting of Hill House and Bly Manor. I don't watch a lot of horror things, usually when Halloween comes around, I watch Hocus Pocus, Practical Magic, and Nightmare Before Christmas, those are my go to's. Oh, but I did watch Cabin in the Woods.

Travis
Oh, yes!

Kaylee
That was sort of like a very different take on the classic horror movie, which I quite enjoyed it actually. Have you seen it?

Travis
I really enjoy that movie. I watched it for the first time maybe a couple of years ago.

Kaylee
Have you seen it, Michael?

Michael
Oh, yeah, watched it in the theatre. Fantastic.

Kaylee
Yeah, you're right. I also watched it when it came out. I didn't just watch it. [laughs] Michael, what are you nerding about? You nerding about bad movies, bad TV?

Michael
I am actually, it's interesting that the last movie that I watched in the theatre was Cats with a bunch of my friends, and it's weird that that's the last memory I have of going to a movie theatre [laughs].

Kaylee
That really should have been the giveaway about what was going to be coming down the pipe.

Travis
There are memes out there saying that Cats caused COVID-19. I love it. I love it all.

Michael
Yeah, but what I've been nerding out about this week has been asteroids. NASA sent a spacecraft that's been orbiting around an asteroid Bennu, and just the other day they actually

did this TAG event, touch and go, and collected some samples of the asteroid. The spacecraft is called OSIRIS-Rex, and it's actually a really cool name. It is an acronym that pulls together everything that the spacecraft does its Origins, Spectral Interpretation, Resource Identification, Security, Regolith, Explorer, and Osiris is an Egyptian god, that is the God of agriculture. So, like the spreading of the seeds, fertility, and asteroids potentially bringing life here to our planet originally, but also Osiris has a dual role as the god of the underworld, which mirrors the destruction that a large asteroid could have on our lives. So, I have this cosmic perspective, and if anyone wants to go onto my socials, @michaeljohnunger and see how I've mirrored asteroids to humans, and their self-reflection, and I think the importance of why we go out into the solar system. Why would we want to go to an asteroid? Why do we need to understand that rock? Well, because it helps us understand Earth better. As humans, and as adults, I think that it's really important for us to do some of that self-reflection, even more so as we get older, because there's this danger of us becoming more pessimistic, but we're still evolving. This particular asteroid Bennu is actually more like a rubble pile. Like, it's not like a solid rock, it had been impacted, and all of the pieces kind of came back together to form this new piece. You can imagine as humans we have these big impacts that happen in our lives, and that impact changes us in some way as we come back together. I think it's important for us to encourage self-reflection, even in our older adult years, because we can learn something new about ourselves, and I think that's really important. Kaylee, what are you nerding about?

Kaylee
You know I'm actually also nerding out about Osiris. Travis, I don't know if your eyes popped the same way mine did. So, I'm constantly in a state of nerding out about Buffy the Vampire Slayer, and I just found out that Travis is also a huge Buffy fan, stan, whatever.

Travis
Love, love, love, love, love Buffy the Vampire Slayer, everything about it, favourite series.

Kaylee
Both obsessed. It's so funny that you just mentioned Osiris, Michael, because right now I'm nerding out about season 6, which actually features the Urn of Osiris. So, when you get there, you will have a light bulb moment.

Michael
I'm still on season 3. So just be careful.

Kaylee
I just want to say that I've made it through TNG, a lot faster than you so you really need to pick up. So, I'm nerding out about season 6 Buffy I love actually season 6, it's my favorite season. I know it's a hot take.

Travis
A good season.

Kaylee
It is a good season. It's actually very in line with today's conversation around pessimism and optimism. So, I'm about to spoil some things. Michael doesn't have a choice, but if you're listening right now, and you are going through it for the first time, and you don't want to have it spoiled. Turn it off, come back in when you've got like 30 seconds at the end of the episode. So, I'm nerding out about season 6. I love this podcast called Buffering the Vampire Slayer. Travis also listens to Buffering the Vampire Slayer.

Travis
Yes, I do!

Kaylee
There's a live watch today, and I was thinking, “today I get to watch Buffy, and I get to talk about rats, which are my two favourite things”.

Travis
An amazing day!

Kaylee
The best day, I would love to talk to you Travis, as this nerd out is a little bit of a crossover between Buffy, rats, and optimism/pessimism. So, I made Michael watch season 3 episode 11, Gingerbread. In that episode, one of the characters Amy becomes a rat, then three seasons later in season 6, gets turned back.

Travis
Oh my gosh. It took so long.

Kaylee
I know poor Amy, it's like Willow is amazing at magic, but somehow it took her forever to get Amy out of rat Amy.

Travis
So, hilarious I feel like a lot of people are talking about that too, she can do all these things, but Amy’s still a rat. [laughs]

Kaylee
Amy's a rat, Amy is no longer a rat in season 6, and Amy is not the Amy that we remember Amy being. I mean, she seems well enough adjusted for having been a rat. We learned that Amy has a darkness that Amy did not have before. So, I'm wondering, were there any signs in Amy the rat that Willow could have looked at to know that maybe she should just leave Amy as rat Amy?

Travis
That is so interesting, like really and truly because Amy the rat actually had quite a bit of enrichment in her cage, like not all rats have so much enrichment, and things that they can do in their cages. Normally that would equal out to being more positive later on. What Amy the rat also had was the fact that she use to be a human, and so she had a grudge that she held with her. So, I feel like that grudge even with the environmental enrichment that would normally lead to a happy rat, made her become what she ends up being when she resurfaces from being a rat. This is a hilarious conversation I've never thought about. [laughs]

Michael
Well, Travis, thank you so much for joining us today on Nerdin' About. If people want to learn more about you, and your research, where can people go?

Travis
Yes, so I post, I like to retweet a lot on twitter @TravisEHodges. I'm also a part of the organization known as the Women's Health Research cluster, in which we emphasize the importance of including sex differences in research, because a lot of research focuses on males, especially adult males. We do a lot of talks about sex differences in health research, and why it's important to measure all of these things in different sexes, as well as for me, different age groups. I have a lot of talks with that organization as well in which I talk about age differences, and how special they are. That can be found at WomensHealthResearch.UBC.ca to get a lot more information on that.

Kaylee
Amazing definitely go follow both the research group, and go follow Dr. Travis Hodges, and thank you everybody so much for listening. It's such a treat to spend our time with you I literally had the best time learning about rats, and Buffy the Vampire Slayer. If you want to follow us, you can follow us on our socials @NerdNiteYVR. You can like and subscribe to this podcast, and that certainly helps us engage with more folks. This is our last full length episode of what has been Nerdin' About Season 1, and we'll be taking a bit of a break to prepare for Season 2. We'll still be back in a couple of weeks for a bit of a chat about the season, but until we meet again, reward yourself with some Cheerios.

Travis
Honey Nut Cheerios, Honey Nut! [laughs]

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