What is risky drinking? What is the cognitive profile of a risky drinker? If we know more about how risky drinkers think, is it easier to develop models for preventive measures?

APS’s Özge G. Fischer Baum approaches these questions with a cognitive lens in an interview with Elizabeth Goldfarb from Yale University. Fischer Baum and Goldfarb discuss how risky drinkers generalize and overgeneralize categories differently from the general population. The conversation evolves into ideas about possible interventions for alcohol-use and other substance abuse.

Goldfarb also published on this topic in APS’s flagship journal, *Psychological Science*.

If you want to know more about this research, visit psychologicalscience.org.

**Unedited Transcript**

[00:00:13.940] – APS Özge G. Fischer-Baum
What is risky drinking? What are the thinking processes that lead to such behavior in general? What is the cognitive profile of risky drinkers? This is Under the Cortex. I am Özge Gürcanlı Fischer-Baum with the Association for Psychological Science. To answer these questions, I have with me, Dr. Elizabeth Goldfarb from Yale University. She is the author of an article published in APS’s journal, *Psychological Science*. Elizabeth, thank you for joining me today. Welcome to Under the Cortex.

[00:00:47.720] – Elizabeth Goldfarb

Thank you for having me.

[00:00:49.430] – APS Özge G. Fischer-Baum

I want to start with your research question right away. Your research explores the thinking paradigm of risky drinkers who are risky drinkers. And how are you first got interested in this work?

[00:01:04.610] – Elizabeth Goldfarb

So risky drinking is basically engaging in patterns of alcohol intake that are associated with higher risk for negative outcomes, both for physical well-being and for mental health. So what that looks like is things like regularly engaging in binges where you consume a large amount of alcohol in a short amount of time, or just persistently having overall high levels of intake throughout your week. And the way that I got interested in this was a little bit circuitous. So my background is more in how stress influences memory. And of course these are both processes that are related to substance use. Right. Like stress can be a huge trigger for folks to start drinking more or using more substances. And we also know memory plays a really important role in processes like lapse and relapse. So that’s what first got me thinking. Hey, maybe drinking would be a place that these questions will have real impact on people’s lives. And one thing that I learned as I started getting into this area was that alcohol actually changes your body’s stress response. So people who drink a lot have really high levels of what we think of as stress related hormones.

[00:02:18.650] – Elizabeth Goldfarb

So maybe the alcohol itself could change the way people are remembering their experiences. So the alcohol itself, we could think of as a modulator of memory that could contribute to more use later. So that got me really interested in, well, do these folks who drink a lot actually learn and remember differently?

[00:02:39.050] – APS Özge G. Fischer-Baum

Very interesting how you first started thinking about that. And in your research you talk about generalization and over generalization. These are cognitive concepts. How would you define them for our listeners?

[00:02:56.370] – Elizabeth Goldfarb

Sure. So basically, we can think of generalization as applying knowledge from past experiences to new
similar situations. And over generalization is applying your knowledge, perhaps to less appropriate situations, as kind of like a quick way of thinking about the distinction. But in a specific example, say a dog bites you. You want to use that to inform how you interact with dogs in the future, right? You don’t want to just walk up to another dog, stick your hand in front of its nose, and I wonder what’s going to happen now. You want to be able to use your past knowledge, right? But you don’t want to take that to an extreme and start being really afraid of even seeing any dog far away from you across the street. So we’d think about the first one of just taking your knowledge and using it adaptively as generalization. But taking it too far would be a form of overgeneralization.

[00:03:51.930] – APS Özge G. Fischer-Baum

Yeah. And how is all generalization related to anxiety in general?

[00:03:56.880] – Elizabeth Goldfarb

So there’s a lot of good research from the laboratory, but also observations clinically that anxiety disorders are associated with a tendency to overgeneralize fear. So especially to situations that are actually safe ones. So if you’re in the laboratory, for example, maybe you learn that a blue square is associated with a shock, but a green square isn’t. And then you can show people a continuum of colors shifting from blue to green, and you see how long they anticipate a shock, or how much their body acts like they think a shock is coming as you move along that color gradient. And what you see is that people with anxiety disorders take that fear association much closer to green, much closer to what’s actually safe than folks who don’t have anxiety disorders.

[00:04:51.630] – APS Özge G. Fischer-Baum

So people with anxiety disorders come into the situation with more overgeneralization bias. Is it what you would say?

[00:05:00.090] – Elizabeth Goldfarb

Yeah, that’s especially for threat associations.

[00:05:04.680] – APS Özge G. Fischer-Baum

And in your study you found a relationship between over generalization and risky drinking. What is this relationship. Sure.

[00:05:13.470] – Elizabeth Goldfarb

So I think it helps to give a bit of a sense of how we measured it to explain it. But I think the key takeaway is that folks who engage in these problematic, these risky patterns of drinking behavior tend to spread out, specifically associations with alcohol. So we told people that they were going to play a card game to earn tokens that would add to a financial bonus they’d get at the end of the study. So first they learned which cards would earn them the tokens, and then they got to choose in the second phase, which cards did they want to play with? So what was happening under the hood in this game was that one card
was paired with tokens that were actually pictures of alcohol, and the other card was paired with tokens that were just pictures of common objects. And the reason we did that was to see, are they really focused on alcohol related reward, or is it just any kind of reward that they’re going to generalize more? And then the third card was very rarely paired with any kind of token.

[00:06:16.590] – Elizabeth Goldfarb

So what we were able to do then. So these cards have kind of black squiggly shapes on them that were validated by Morgan Burns’s lab to come from basically a color wheel of shapes, so that as you move along this wheel, the shapes get more and more dissimilar. So we’re able, just like in the beginning, going from blue to green. Now we can track multiple gradients as the squiggles become less and less similar to each other. And those are the cards we’re asking people to choose to play with in the second part of the game, so we can see if you learned this squiggles associated with an alcohol outcome, will you continue wanting to play with cards that look less and less like that one that earned you an alcohol reward? And will you do that just for the alcohol reward or for any kind of reinforcer? And what we see is that the folks who are lighter drinkers tend to be more circumspect. So they go back to chance as the cards get less and less similar, they’re less likely to play with the ones that don’t look like what exactly what earned them a reward.

[00:07:25.200] – Elizabeth Goldfarb

But people who engaged in riskier patterns of drinking behavior stretched these alcohol associations specifically out farther. So they showed this tendency to pick cards that even if they didn’t look very much like the one that was paired with alcohol, they still want to approach it, they still want to play with it. And we also did a follow up experiment to see, is this just about reward? Because you could imagine that maybe they’ll remember the good times with alcohol and really spread those out to less appropriate situations. But maybe negative reinforcement. They won’t show that pattern. So we did the study again, but now they were penalty tokens. They were going to take away money from our participants. And they also over generalized alcohol punishment. So they showed a tendency here to avoid cards that looked anything like the one that was initially paired with an alcohol punishment. So it’s showing that there’s just this overall tendency to take what you learn about alcohol and spread it out to overgeneralize alcohol associations in a way that’s really specific to alcohol. But valence general, it doesn’t matter if it’s gain or loss.

[00:08:34.860] – APS Özge G. Fischer-Baum

Yeah. So both for carrots and sticks they are all generalizing right.

[00:08:39.930] – Elizabeth Goldfarb

Exactly. Alcohol carrots and alcohol sticks.

[00:08:43.350] – APS Özge G. Fischer-Baum

Yes, exactly. And I find your paradigm quite interesting because they are not in fact drinking. It is just a picture of alcohol. But it is even with a minimum manipulation like that. You see the pattern. So it is
Quite interesting.

[00:09:02.700] – Elizabeth Goldfarb

Yeah, there’s a lot of work in the substance use field on what are called reactivity studies, where you’re showing people pictures that are relevant to the substance that they use, and you compare brain responses or attentional biases to those compared to something that’s not a drug related cue. But yes, we did do this study online, so couldn’t really provide people with the alcohol reinforcement during the experiment. But yeah, I agree. And it also it is itself a form of generalization. Right. You know this card is related to this or this image. Rather this picture of alcohol is related to the reinforcing properties of alcohol.

[00:09:43.500] – APS Özge G. Fischer-Baum

And I want to take a step back. I want to ask why you did this study in the first place. So why do you think it is important to understand the thinking paradigm of whiskey drinkers?

[00:09:56.780] – Elizabeth Goldfarb

Yeah, it’s a great question. So I think as a cognitive neuroscientist, we want to understand the underlying mechanisms that give rise to problematic behaviors like risky drinking in this case. And we know that memory plays a huge role in substance use. You can’t relapse in a place where you used to use if you don’t remember that you ever used there before, but we don’t know what it is that they’re remembering. So many of the projects we’re doing in the lab are trying to isolate. We have all these different memory systems, all these different types of representations, which are the ones that are really motivating this problematic behavior. And once we understand which memories they are, we can start to think about how can we target them, how can we help people form different, perhaps more protective associations that build on the same sorts of underlying cognitive mechanisms?

[00:10:51.350] – APS Özge G. Fischer-Baum

So I want to follow up on that a little bit. What do you mean by protective associations? Do you envision an intervention study using your results?

[00:11:04.260] – Elizabeth Goldfarb

So there was one sort of incidental finding that we had in this experiment, which is that all the tokens that participants saw were different on every trial. So we actually did a surprise memory test at the end to see whether they remembered the tokens that they received. And it turned out that, at least for our light drinkers, having more precise episodic memory was associated with less generalization. So having really detailed, really specific representations was actually protective against this tendency to generalize. So that was pretty preliminary from this study. And it’s something we’re following up on. But it suggests that maybe we can try to work on how people remember substance use experiences to kind of mitigate at least this particular process of generalizing.

[00:11:54.870] – APS Özge G. Fischer-Baum
Maybe giving. Do I understand it right? Maybe giving them the details of an event when they were using a substance. So they are going to have a more objective version of what happened.

[00:12:08.880] – Elizabeth Goldfarb

Or at least a more detailed one that really ties it into the context where it happened, so that maybe you’ll be less prone to stretch it to other situations.

[00:12:20.220] – APS Özge G. Fischer-Baum

And do you think your research is generalizable to other substance use?

[00:12:25.860] – Elizabeth Goldfarb

Well, that’s necessarily very speculative at this point since we haven’t looked at other substances, but my guess would be yes. Particularly thinking back to the idea that taking large amounts of substances alters stress related processes in the body that’s not specific to alcohol. So in fact, most addictive substances lead to dysregulation of hormones like cortisol. So if that’s really the mechanism that’s driving this learning bias, then yes, I would guess that it’s generalizable to other substances as well.

[00:13:04.740] – APS Özge G. Fischer-Baum

And my next question is about preventive measures. What are the other possible preventive measures for risky behavior.


Well, this is something that obviously memory isn’t the only avenue toward preventing risky drinking behavior. But as a memory researcher, that’s kind of what I gravitate toward. And there’s this idea that researchers like Aaron Bornstein have put forward where we do sample from our past experiences, like this idea of chasing the first high that you’re trying to get to recapitulate an earlier experience you’ve had with a substance. So maybe trying to make other features more salient, other, not drug related associations make those come to mind more, to try to stop people making the choice to use or help them remember the negative consequences. Like you had a bad hangover the last time you did this. Maybe make those representations be more dominant to help people make a different choice. And there’s some really interesting work in the non-human animal literature about other types of reinforcers, like rodents choosing to hang out with other rodents, to have social time with other animals rather than use substances. So trying to again amplify how easy it is to access other types of rewards in memory, rather than just focusing on the substance.

[00:14:34.140] – APS Özge G. Fischer-Baum

Thank you for joining us. This is Özge GürcanlıFischer-Baum with APS and I have been speaking to Dr. Elizabeth Goldfarb from Yale University. If you want to know more about this research visit PsychologicalScience.Org.