Opinion Science Podcast
Hosted by Andy Luttrell

Opinions in the Brain with Uma Karmarkar
April 10th, 2023

Andy Luttrell:
There's this new song that I just came across online. Listen to it. You think it'll be a hit? [CLIP OF POP SONG] You probably can't tell me if this one's gonna hit it big. But your brain might. In 2006, some neuroscientists were hanging out on MySpace—ugh, 2006…those were the days. And they downloaded a bunch of songs from unsigned and unknown artists. Songs that ranged from Rock to Country to Hip-Hop. They took each of these songs and found just 15 seconds around the hook or the chorus.

Then they got a bunch of volunteer human beings and loaded them into an fMRI—functional magnetic resonance imaging—scanner. It's essentially a giant magnet that's able to periodically record which areas of a person's brain are working especially hard. So people are in this huge machine, and they get to listen to music. The researchers played those 15 second clips of unfamiliar songs and asked people how much they liked each clip. But the whole time people were listening to the song, the fMRI was recording what was going on in their brains.

As far as anyone's concerned at the time, the study's over. They just sit around for a few years. I mean, I'm sure they worked on other things, but they what they really wanted to know was how successful all those songs would become. They had played 120 songs for people lying in that brain scanner, and 3 years later, they could trace 87 of those songs to a music database that also indexed the songs' popularity. And sorry MySpace, but a lot of the songs turned out to be commercial duds. But not all of them. Some even ended up on albums that sold hundreds of thousands of units.

The researchers wanted to know whether their focus group of people and brains had been able to tell the difference between the duds and the hits. So first, if you just look at how much people said they liked the songs, their opinions didn't help identify the commercial hits. But look into their brains, and you have a different story. A clump of neurons we call the "nucleus accumbens" was related to how much people liked a song, but it was this signal in the brain that could actually predict future sales. The more people's nucleus accumbens was jamming out to a song, the more copies of an album containing that song were sold in the future. Sometimes, it seems, we can get a cleaner look at opinions by looking deep inside our skulls.

This idea's come to be known as a "neural focus group," and we now have a few more examples of them. One study showed people different TV campaigns to help smokers quit. When they were

surveyed, the focus group couldn't really predict which commercial would be the most successful, but you know what could predict which ads would actually get smokers to seek help? The patterns of activity in the focus group's brains as they watched the ads. In this case, the more a commercial tickled people's medial prefrontal cortex, the more influential that commercial would be when it actually aired on TV. Another study showed people sales displays for chocolate bars, and the way their brains responded was able to forecast how effective those displays were at getting people to buy the product in actual supermarkets.

Our brains know some stuff! Thank goodness. But how far do we really take this? What have we really learned about the brain? What have we really learned about people's opinions? Is this a practical marketing tool or just a set of curious findings? Good news! Our guest today can help us sort through those questions.

You're listening to Opinion Science, the show about our opinions, where they come from, and how they change. I'm Andy Luttrell. And this week we welcome Uma Karmarkar. She an assistant professor at the Rady School of Management and the School for Global Policy and Strategy at UC San Diego. She combines neuroscience, consumer psychology, and behavioral economics to understand how people make decisions…especially when they seem to have too much or too little information to go on. I wanted to get Uma's take on the idea of neuromarketing—how neuroscience might provide insight and strategies for understanding the marketplace. She's written a lot on this topic, and we had a great conversation.

I say this in the interview, but just to tee things up, until recently I really only knew of Uma because of this research she did with Zak Tormala at Stanford. We actually talked about it when Zak was on the show—go check out Episode 16. Basically, the gist of those studies has to do with whether people are more persuasive when they express certainty or doubt. But they also wondered if this depended on the person's apparent expertise because an expert expressing certainty…that's to be expected, but when some bozo on the street says he's certain, we're like: "what? What makes you so sure?" Same with doubt. A random guy saying he's uncertain sounds about right, but when an expert says they're uncertain, we're like, "what? What do you mean you don't know?" It's these moments of surprise that make us look a little more closely at what the person has to say.

Anyhow, I've always loved those studies. And as far as I was concerned, that was Uma's key contribution to the world. But then a little while ago, I happened to discover this impressive body of work she has bridging neuroscience and consumer behavior, and I was like, "What?" So here we are. Happy to bring you along for the ride, so let's hop into my conversation with Uma Karmarkar.

Andy Luttrell:
But yeah, I'm happy to have you on, and like I said, it just was a weird moment where I was like, "Oh, wait a minute. This person that I know very specifically for one thing has, wouldn't you know? A whole life outside of the one paper."

Uma Karmarkar:
Surprise!

Andy Luttrell:
I mean, we can… Do you have any questions about what we're doing here, or we can just roll in from there?

Uma Karmarkar:
No, no. This seems pretty straightforward. This seems great.

Andy Luttrell:
So, I imagine that was one of the earlier things you had done, so for context, this is the stuff on sources who are more or less confident who are also higher or lower in expertise, and that kind of having impacts on how people approach messages that they get from them, which is very bread and butter, like I'm not surprised that Zak Tormala was involved in something like that. And so, was that… How much of that was like, "Oh, I have this strong interest in source expertise," versus I got wrapped in this person who does this kind of work, and so we hatched this idea? Was it part of your core sense of academic identity, the work you were doing there? Or did it feel like a one-off at the time?

Uma Karmarkar:
There are three questions.

Andy Luttrell:
I know. I know. That's what I do.

Uma Karmarkar:
They're all good ones. For full transparency, I was relatively early in my marketing graduate career, so I have a PhD in neuroscience and had been studying a range of questions related to how humans process information of different kinds. Time processing, learning and memory. I kind of had been doing that in animal models and human models prior to even starting a marketing PhD. I come over into a marketing PhD and learn all of this extra, additional, new to me stuff about how this integration works in some of the nuance starting at the psychological level, and moving up, I guess, from there.

And I had the opportunity to connect with many of the faculty at Stanford at the time, including Zak, and one of the things that I had found fascinating about Zak's research in social psychology, which again, coming from neuroscience was within the realm, but on the edge of it in terms of where my knowledge base was, is that Zak had all of these fascinating papers on information processing, as well, and on dimensions that computationally made sense to me, but also papers that I thought had parallels in the neuroscience literature that I was more familiar with. So, for example, the past model of implicit attitudes, right, past attitudes are still there, is this model where you form an attitude and then when you form a new attitude you don't erase the prior one. You just kind of tag it with a different valence. You add an update tag to the prior attitude while you're coding the new one.

And there's evidence from neuroscience and evidence from work in owls and all kinds of other models that this is one of the ways that memories get created, and that you do have residual

memory networks from prior memories that you retain even after you form new functional memory networks kind of over the old ones.

So, I saw a lot of connections in places where I felt very comfortable with the conceptual ideas that were grounding the research, even though the expression of that was wildly different and on wildly different scales of thought, you could say, so that's I think a little bit the point one about how seminal this research was to my identity. It was more about drawing these connections and finding my way in this somewhat new path of applied decision making as opposed to the basic science at the literal neuronal level.

I did find certainty incredibly interesting. Again, I had not been aware of that span of research, but also that those questions had useful and profound structures and frameworks around them that let you test questions that on the surface felt maybe squishier, for lack of a more refined technical term. And the idea of uncertainty and the idea that you're seeking information, and then using that information to build a perception of the world around you felt very natural. The specific question about attitude certainty, and source, and persuasion, that framework was relatively new to me and one that Zak and the program itself as a graduate student introduced to me, but it was an exciting place to get started.

And I think what I love about that paper, I'm trying to hit all of your questions.

Andy Luttrell:
You're doing better. I don't even remember all of my questions, so you're doing great.

Uma Karmarkar:
I think what I love about that paper is the key with all respect to Zak's beautiful body of work, the key isn't specifically that it's an expert or it's the source. The key is that the reader detects an incongruity in the information that they're getting, and that information detection process on the part of the reader triggers an interest in processing more carefully, or using heuristics to process less carefully. And so, the powerfulness of expressing certainty, reducing uncertainty, transmitting confidence, is mixed with these informational processing mechanisms that the reader or the recipient of the message is doing, and so it wasn't, again, just the source certainty expression, but that you could transmit that level of certainty and that it interacted with information processing mechanisms on the perception of the reader.

I don't know if Zak feels about it in exactly the same way. My guess is it's a more natural outflowing of the work that he was doing. But I quite owe him a debt of gratitude in allowing me to work on a project with him that allowed me to learn so much about that space and then also connect it with the kind of box and arrow models that I was already more comfortable with.

Andy Luttrell:
As you were saying that I was realizing a point of connection is the first paper I ever wrote in grad school was a review paper on metacognitive confidence from a neuroscience perspective. And so, drawing in a much less sophisticated way than you put it just now, but drawing those connections between, like we have these kind of basic neuroscience models of how we form memories, express confidence in those memories, sort of which are the memories that we subjectively experience as

more certain and true, and so it was also making me reflect on thinking about the process of writing that paper. I came into grad school really wanting to do neuroscience, so as a… That was sort of my baseline, like I wanted to do neuroscience, and I wanted to do this attitudes work, and did a little bit of it but ended up straying from it. We can get to sort of my own frustrations and insecurities about neuroscience later.

But what I'm thinking about is for me, and for many people, I'm sure, who are doing work in social neuroscience, consumer neuroscience, they are being exposed to both of those worlds simultaneously, right? And so, I'm sort of navigating this, and I'm reading it over here, and I'm reading over here, and I'm reading over here, and I'm trying to create these connections, and I knew that you did sequential degrees, but it didn't dawn on me how important that probably was in setting up the particular way in which you pursue these social and consumer-related questions. So, what would you say? You have to be a rare person in the world to have gone from a neuroscience PhD to a marketing one. That particular combination doesn't strike me as happening every day. But what was it? You'd reached the end of being a neuroscience expert and you pivot, and what was that? What was that inflection point for you?

Uma Karmarkar:
Oh yeah, so I didn't… I saw it as a pivot, but I didn't see it as the end of the neuroscience. So, I had been doing a postdoctoral research in learning and memory at the cellular level, and I realized that the deeper that I got into the biological part of that, the less time I was spending on some of the implications for human expressions of learning and memory. So, I had managed to kind of keep a blend of psychology and neuroscience throughout my graduate career, and as I went into my postdoc it veered pretty sharply into the biology, which is great, and fascinating, and incredibly interesting, but I had been sort of doing that post-grad school, who am I gonna be when I grow up type of thinking. And so, I was… Worried might not be the right word, but I was thinking about what I wanted, and having lost that connection to human consciousness, human thought, human complex cognitive processes was a little bit sad, and I was trying to think about how to get back to a place where I felt like I could span those two sides of the equation or those two sides of the problem.

And so, then I was thinking, "Well, you know, in biology and in psychology it's not uncommon to do a couple of postdocs, so maybe I do the biology one and then I do the psychology one." And at the time, the field of neuroeconomics, or consumer neuroscience, was relatively nascent. There had been one or two meetings of what would become the society for neuroeconomics. But I happened to be in the Bay Area, and a lot of the people who were very instrumental in starting this direction of research in a formal sense also happened to be in the Bay Area. In addition to that, I have family members at business schools. In fact, specifically my father is a professor at a business school and he would mention offhand that people were coming into the business school and giving talks on decision making that were grounded in neuroscience.

And I just never saw that mix as even a possibility, so in addition to looking at how I could span into psychology, I started talking to people who were doing neuroeconomics research, people in business schools, and I saw the potential for overlap. The exact specific experiments that people use are not identical but the field of judgment and decision making, for example, does a great job at spanning the more applied versus the more disciplinary science research. And once I saw that

span, it seemed really exciting and the idea that you could take this kind of neuro-infused set of models, or data, or whatever, and shift that into a place where you could understand something about some of the hardest problems about how people think, like I think decision making is one of the hardest problems about how people think, is kind of magical, and exciting, and extremely dangerous when you're trying to still think about what you want to do for your job.

But the more that I pushed on it, the more it looked like a possibility. I mean, there were some very practical aspects too. I feel like it's important to say that explicitly. I was burning out a little bit on some of the animal lab models. The way that business professors run their research programs is qualitatively different than the way that you might run a research program in a more traditional lab setting. And some of those things offered me flexibility in a way that I found appealing.

So, part of it was the job in addition to the research, but I didn't want to find a career path that excluded the neuroscience training. It was more that I saw a way to take the parts of the neuroscience training that I loved, move them closer towards psychology, and maybe do something maybe cutting edge in the process if I was very, very lucky, which to some extent I think I got lucky and I had a lot of fantastic opportunities and mentors along the way that made that easier.

Andy Luttrell:
There's an applied flair to it, too. I mean-

Uma Karmarkar:
Oh, for sure.

Andy Luttrell:
At least some can approach it from that direction and I'm curious, how important was that for you? Where it's like, "Oh, this is just sort of a… It happens to be a consequence but I don't actually care as much," versus, "No, this is also not a place where I can sort of be on the cutting edge of how we think about brains and how they make decisions, but it also may end up plugging into real infrastructure, real ways in which people conduct themselves."

Uma Karmarkar:
I'm not sure I have retroactive inference of that as well as I might want to. I would like to think that I had this all planned out. I am not 100% convinced I saw that clearly. I thought it was exciting. I thought it was interesting. I liked the fact that it was potentially impactful. I might even go as far as to say that I was a little bit wary of the promises of applied relevance coming in because I think those are big promises to make and not all of what I saw in the field at that time felt like those promises were justified. So, I doubt that that was what sent me into the applied field. I think the potential for it, or even, again, trying to be radically honest here, even the potential to curtail some of the wilder claims that were being made might have actually been part of what was potentially interesting. You know, I'd see something said about, "Oh, companies can use it this way," and I'd think, "Can they? Wait a minute. It'd be really nice to know whether they could."

But I definitely feel that that's one of the huge factors that I find appealing right now, is the ability to maybe move the needle, to maybe say something that's impactful in policy spaces as well as business ones, and to connect these things, because realistically companies and governments are

using the science whether or not an academic chooses to bridge those gaps. So, whether it's a nudge unit in the U.K. or U.S. government, or whether it's a company using eye tracking, or a company partnering with an FMRI lab, they're doing that. So, in that case, having people who also can speak those languages seems like a useful thing, but I'm not gonna pretend I had that figured out transferring from neuroscience to marketing.

Andy Luttrell:
Eventually I want to get your take on helping people sort through claims that are maybe bolder than they ought to be, because this is an area where I share the concern that like… People can really run further than they should based on the state of the science. But before we get there, maybe we lay some groundwork as to what is the best case scenario? What can neuroscience actually do for an understanding of marketing consumer behavior? If you were to sort of sell this idea, like neuroscience is an important tool and/or perspective for consumer psychologists, what's the pitch?

Uma Karmarkar:
I think we should first start with addressing the elephant in the room, which I think has come up quite often, which is should neuroscience replace traditional consumer psychology tools? And the answer is no, that's ridiculous, right? Any new technology, there's always this rush to think, "Hey, that's gonna be the new thing and we won't have to use those old slightly broken tools where familiarity has bred contempt."

I personally see neuroscience as expanding the portfolio and the toolbox, and that's a critical pillar in making the pitch that it has relevance to this. I think there are places where we hit dead ends with the other methodologies that we have. I think there are places where we get the exact same behavior or where people don't have as much access to the processes that may or may not be involved in their behavior, or in their outcomes, or in their choices, and once you get to that point, if it's important for you to understand the mechanisms, and if it's important to understand the mechanisms to make predictions about behavior in multiple contexts, there's a benefit to using any data you can that will provide convergent angles on what's going on when that decision unfolds.

So, the second half of my pitch is about that when the decision unfolds part, because you know, sales data in a sense, if I take that extreme as a foil, sales data is a snapshot of a decision in time. But we know that all kinds of things went into how that choice is made. We know in the simplest version that other things on the shelf may have caught our attention. We know we may have taken more or less time. We know we may be retrieving different things from memory. All the cool stuff that, by the way, neuroscience and consumer psychology studies, right? Any of that could have been possible.

So, if you have more information about the setting, about the background, about where someone's eyes went with an eye tracker, about the twitch of their muscles related to smiling with emotion coding, or the internal processes, maybe a detection of prediction error, right? Maybe a change in the pattern of information integration and prefrontal cortex. Any signal that you can get that can enhance and add all those other measures that we have to give us a fuller picture. So, I think that's the high level, broad conceptual pitch.

To back it up, we've got a little more data now. More people are doing this. I know you mentioned it's a rare bird that goes from neuroscience to consumer psychology. Not so rare anymore. There are at least 30 or 40 of us in marketing, a couple in finance, a couple in management, so there are at least 30 or 40 people who have some form of neuroscience training and are including and or applying this in their research in business schools to date, and more coming up through the ranks. So, as this research accumulates, we are learning that we can tell the difference in things, or again, enhance that body of knowledge.

One of the potentially more easy to explain impacts comes from the field of what's called neuroforecasting. There's a bunch of cool studies, some from consumer neuroscientists, some from people in communications departments, regular neuroscientists (whatever that means). All kinds. Psychologists. We've got everybody doing a little bit of neuroforecasting and the general idea is that if you scan the brains of a reasonably small sample of people, so 30, 40, 50 people, you actually get additional insight on predictions of what might happen across the population, that there's some signal that you get from brain data that isn't well captured or precisely captured in other forms of data measurement like eye tracking, or behavior, or something else. And there have been beautiful studies, I can go into detail, showing that this brain signal does add an additional understanding of the variance in population level behavior related to things like how many people watched a particular movie after seeing the trailer, or how effective as an anti-smoking ad?

Andy Luttrell:
Yeah. For my money, on my own personal journey, that's the literature that really changed the game for me. Because I sort of reached a point of disillusionment where you're like, "Okay, we're just seeing the stuff we see in our surveys and brains," and so what's… Is this really of value? If you think of applied value, you go, "Oh, so I could either scan brains and spend thousands of dollars or I could ask six questions to a bunch of people and essentially get the same outcome."

Uma Karmarkar:
The same answer.

Andy Luttrell:
But these neural focus groups, they do that clever twist where they go, "Ah, but if you only used the stuff people can tell you in surveys, it's not sufficient," right? You're getting more from the brain data than you can from these surveys. Do you have a sense, though, how good… Okay. You're reacting to that, so I'm gonna pass the ball to you then.

Uma Karmarkar:
So, I think there is a little dirty secret, which I'm probably not supposed to say since I'm on the pro-neuro side here. I think most of my colleagues would probably still agree with me, though. I don't think it's that the surveys are insufficient, and I think that one of the tricks that we pull is that we scan 30, 40, 50 people, and then the surveys are from those same 30, 40, 50 people, and we say, "Hey, the neuroscience data is doing better than the survey data." I think a one-to-one comparison would be doing the neuroscience data on 30, 40, 50 people, and the survey data on 500 people, because that might be what a firm might do.

So, even with that, I still think the neuroscience data is probably adding value beyond it. But I don't think that should ever imply that the survey data is irrelevant or not adding value itself. I think, again, I really want to hit this hard, because I think it's such an important point. I think it's complementary and arguing that one is insufficient or incomplete is not as productive to helping these fields merge better than suggesting that they are, again, complementary, or can build on them, or that the neuroscience, again, adds dimension or components that allow us to make better predictions.

Andy Luttrell:
Yeah. Point well taken that we wouldn't want to call it insufficient, because we know that those surveys are useful. We've been using them for a long time.

Uma Karmarkar:
I really hope so.

Andy Luttrell:
But the story is more about incompleteness, right? They go, "We're getting stuff from brain data that you're not getting." It's not saying you're not getting anything from surveys, but you aren't getting some of the stuff we're getting from the brain data. Now, could you eventually figure out what brains are doing and then write questions that tap into it more directly? Because my other question is do we know much about what it is we're getting from those brains? Or is it just like, "Oh, we can at least tie this pattern of activations to the success of these messages?" But I don't actually know what we've learned from the brains other than they are picking up on some intangible feature.

Uma Karmarkar:
That is such a great question and I think that one's still in progress. So, first principles were establishing that there is some signal in the brain that adds that feature to your point. The second question is is that interpretable? Is that psychologically interpretable? Can we map this onto processes or enhance our descriptive processes to incorporate what that signal is? Otherwise, we're kind of treating the brain like one of these AIs, right? It generates something. We don't know what the hidden layer looks like, but it seems like a good idea.

Andy Luttrell:
Good job, brain.

Uma Karmarkar:
Exactly. Good job, brain. Well done. Thank you for that data. Again, I'll probably get myself into trouble a lot here, but I think we don't know yet. There are people doing really nice work in that interpretation space. This is where we get to talk about one of the huge problems with functional magnetic resonance imaging data, which is the reverse inference problem. Just because a brain area lights up in a scan does not mean that you can interpret exactly what that brain area is doing based on where it lit up in prior scans.

So, to make that a little bit more clear, if a particular brain area is associated with fear and it also lights up in a different task, you might be tempted to say, "Oh. Well, this task number two is also

about fear." There are very few brain areas that do only one thing, so the reverse inference problem, it relates to saying task number two is about fear might miss that the same brain area also does uncertainty, or face recognition, or completely different tasks that may also be relevant to what you're trying to study.

So, when we take this brain data and say, "Hey, this brain area is predicting box office sales," or something really interesting, interpreting why it's doing that or psychologically what's happening in that brain area to do that gets complicated. There are really nice models developing, some from Brian Knutson's lab, for example, on what some of these areas might be doing and how we might be able to interpret them. There are incredible repositories of brain data, like one called Neurosynth, that allow us to accumulate, again, all this research that all these clever people are doing, and maybe develop maps of complex representations of thoughts in brain data that would allow us to make these reverse inferences more reliably, and more flexibly, and in ways that encompass the idea that the same brain area can do multiple things.

But I don't know that we've nailed it perfectly yet, at least in my opinion, if I'm being perfectly honest.

Andy Luttrell:
What I love about the field is that it just is so strong willed as to say, "We're gonna keep working on it." There was an early wave where it was like brain mapping, and people were like, "Yeah," all the things that you mentioned, you go, "There are all these problems and what are we really learning?" And that could have killed this bridging psychology and neuroscience, and people go, "Oh, maybe we're only really learning about the brain. We're not learning about psychology." But these folks just go, "No, we're gonna keep working on it." And these models get even more sophisticated, and it becomes about connectivity, and it becomes about patterns, and compiling all these data from all these studies to create a repository like that, that I do just kind of love this underdog, like listen, you don't have to buy it yet, but we're not gonna stop, so eventually-

Uma Karmarkar:
We'll get there.

Andy Luttrell:
Yeah. We may reach that day.

Uma Karmarkar:
I do also think that there are other places where this can offer relatively straightforward types of answers or disambiguation of multiple processes being involved when it looks like the same outcome's happening. So, a really simple example, there's a 2006 paper with Carolyn Yoon as an author where they looked at whether the responses to attributes for humans were the same as the responses to attributes for brands. So, basically do we think of brands the way we think of humans? Now, brands as relationships is a shortcut in the consumer research field for a really long time. You have brands trying to create relationships, brands having personalities. How do we feel about a brand implies that there's some kind of social interaction taking place. And so, this FMRI study showed people attributes related to people versus related to brands, and found that different brain

areas were being engaged, and that seems like a really nice way to get some evidence that we don't think about brands with the same machinery that we use to think about people.

So, another example, I'll lean on my own work a little here. I have a study where we showed people products first, or prices first, and then showed them the product and price together, and then had them decide whether or not they wanted to buy the item. So, we sent people shopping in an FMRI scanner. Real money. Real products. And we found that depending on whether the price or the product came first, we saw different patterns of activity in a brain area that's generally correlated with integration of value or information processing. And I won't go into some of the analysis details here, but it suggested that when you see a product first, the type of decision that you're making is a do I like it decision. You know, what's the affective value of this? What's the reward? How much do I think this is a good thing?

When you saw the price first, the prediction from the neural data was that you might be asking a slightly different question. You might be asking a little bit more is this worth it? And that sounds like the same question. Do I like it? Is it worth it? Economists might even tell you that's the same question. But I don't think it exactly is. If you ask someone those two questions about a bottle of champagne, you probably get the same answer. Do I like champagne is the same kind of question as is champagne worth it to me. Yeah, because I love champagne. Let's talk about batteries now. If I ask you do you like batteries, that's just weird. It's not a fluent question. They're fine. I don't know. But if I say, "Hey, this pack of batteries is $3." It's not hard to answer is it worth it in that domain.

So, the brain data didn't tell us what was going on, but it gave us a nice psychological prediction. We could test that psychological prediction by showing people more hedonic items like champagne or showing them more practical ones like batteries and flipping whether the price came early or late, and when the prices came earlier for utilitarian items like batteries, and flashlights, and water filter pitchers, people were actually more interested in buying those items because the question made more sense to them.

So, I think that hypothesis generation is an under attended to benefit of the neural data. It's not necessarily an answer but it does a great job generating cool questions.

Andy Luttrell:
Yeah. Oh, two simultaneous thoughts on that. Which direction to go in this fork in the road? One is I do love the dissociation between worth and liking and having reviewed some of the neuroscience work trying to make it about attitudes, because neurosciences don't use the word attitudes. All that work often is talking about value, and subjective value, and you go, "I think they're talking about the same thing," but it never quite seems satisfying because it's like how much would I pay for this? How much is this worth? Sounds to me like that's tracking a different system than the way we often think of these attitudes is like what comes to mind when I see this? Do I have a positive or negative reaction to it?

Uma Karmarkar:
Yes.

Andy Luttrell:
And so, that is very nice to show that distinction. Yeah, and I like that as a kind of philosophical note, that's something that neuroscience can let us do, right? It can sort of pit concepts against each other and see are we ultimately talking about the same thing or something slightly different? And as a reason to talk about a study I never talk about, the one FMRI study I have to my name did this with forms of attitude strength, and so some people think that attitude certainty and ambivalence are just two sides of the same coin. When I feel conflicted, I just feel uncertain, and when I'm quite certain, it means I've decided on where I stand.

And we sort of scanned people as they evaluate 100-plus objects and find a dissociation there, to be able to say, "Oh, mirroring the behavioral work, it seems as though certainty and ambivalence are actually two different psychological processes coming to those conclusions."

Uma Karmarkar:
Yeah.

Andy Luttrell:
But similarly, I know there's… Is there work too on being able to show overlap, right? So, you go these two things that might seem different actually are processed in quite the same way?

Uma Karmarkar:
You know, I don't have a good example off the top of my head. I suspect… Well, overall, there's what is sometimes referred to as the common currency hypothesis that regardless of what other neural machinery is being brought into play, most value decisions involve a specific part of the brain in prefrontal cortex that summarizes it as value so that you can compare apples and oranges to make a choice, that there's a summary estimation of… again, value for lack of a better term, of subjective value, that allows you to tradeoff between things that are nominally different because that net subjective value can be compared to each other facilitating a decision. If one has a higher net subjective value, whether it comes from social inferences, or specific attributes, or prior beliefs that the person held, regardless of what fed into creating that value, we can summarize it with subjective value and summarize another thing with subjective value and allow you to make those choices.

That doesn't remove decision conflict. It doesn't remove the challenge of estimating that subjective value. But it does suggest that there's some checkout counter where it's all happening in the same currency. And thus, the common currency argument. So, I do think that there are papers coming from different dimensions that support that principle. To the point of certainty, in fact, really beautiful work from Ifat Levy and others showing that when you're making uncertain decisions that relate more to risk versus ambiguity, that is known probabilities with unknown outcomes, or decisions with unknown probabilities and unknown outcomes. There's different machinery involved in processing the unknown probabilities part, the ambiguity part, but the value assigned to the options seems to be represented in that same common currency brain area.

So, again, you're using all this stuff. No one's saying these are the same kind of choices. But you still have to be able to tradeoff between your two options, even if one's risk and one's ambiguity,

so we're gonna use a similar output representation of subjective value in the brain to allow you to make those choices.

Andy Luttrell:
Nice. Great. Great example.

Uma Karmarkar:
Pulled that one out.

Andy Luttrell:
That was great. The other side, the other fork in the road that you sort of opened up was the hypothesis generation as a way to use these data. And I was thinking about that also when you talked about the neural focus groups where it's like we know the brain's doing something, and now it's our job to figure out what it's doing, and it almost seems like the perfect playground because what else could drive psychology but in the brain. You're looking at all the possibilities, whereas if I'm coming up with my own personal theory, I go, "I have to invent the concept in order to know to ask a question about it."

And like I could never exhaustively survey all the thoughts a person could have, but if I look at what their brains do, I go, "Well, it's gotta be in there. Whatever's going on, it's in there somewhere."

Uma Karmarkar:
Hopefully.

Andy Luttrell:
Yeah. Or who knows?

Uma Karmarkar:
Hopefully detectably. Yes.

Andy Luttrell:
A revolution on the road. Yeah. Right. And you need to have the granularity to be able to find it, but at least you know like, "Oh, we could sort of…" It just flips on its head how people, like you say, often talk about this as, "Oh, we're gonna look to the brain for answers to this dilemma." As opposed to, "No, we're gonna look to the brain to see could we have missed something about how people engage with this kind of information?"

Uma Karmarkar:
Exactly. In fact, I'm gonna run with this a little bit because I even make the argument on the other side of things when it comes to big data, so I make a very similar argument to my MBAs or when I talk to companies that one of the benefits of neural data in the applied realm is that you could A/B test everything that a consumer faces in a retail or really any choice environment, and why not use some of that brain data to constrain the set of questions that you could ask, right? I mean, A/B testing is easy. Do you like the red button or the blue button better? Very easy to do. But in all of the dimensions that people could possibly think matter, if you could hold that down to a

couple more hypotheses that are directional and test those first, maybe you'd just constrain the space in a way that's more efficient, more directive.

So, not only in terms of psychological processes, but even in terms of the outcome behavior, or just how to search a big data space, anything that gives you models to work with seems like it should be helpful. And I mean, that's kind of what we're doing as psychologists in general, right? We're trying to take all the possible thoughts that someone could have and create models, whether they're computational, neurally infused, predictive, descriptive, whatever, to come up with these processes so that we can say that we've organized the types of ways that these things are happening.

Why not use a little neural data in there, too?

Andy Luttrell:
Totally. I previewed this earlier, but I do want to get to this cautionary tale. We've been maybe a little more cautionary than I expected already up until this point.

Uma Karmarkar:
Very careful.

Andy Luttrell:
But in terms of the hype, the risk of hype in neuromarketing, the number of times I see people throw the word dopamine around when they're talking about something that-

Uma Karmarkar:
Oh, no.

Andy Luttrell:
… they have no business talking about dopamine, but there it is. Or you know, people… As a psychologist, it does irk me when I see people talking about what is actually a psychology insight, but it must be framed in terms of what your brain does in the processes of neurons, and you go, "Like yeah, obviously, but you don't have to talk about it as a brain doing those things." And so, we know that there's this allure of neuroscience in the public as to feel like, "Oh, this is the biology of how we do things. Not this mushy psychology stuff." Nevertheless, do you see instances where in the promotion of neuroscience for marketing efforts people go a little further than they ought to? And maybe some signs people can keep an eye out for as this may not actually be all it's cracked up to be?

Uma Karmarkar:
Oh, goodness. Of course.

Andy Luttrell:
Yeah.

Uma Karmarkar:
But I think it's who's doing the overpromising, right? So, I'm not sure we have enough time to talk about all of the things that we're onto here. There's no buy button in the brain. You don't get a hit of dopamine every time you click a like. So, yes, the scienceyness of something makes it feel more real, and more tractable, and like you can argue it further. Oh, well, in the brain it does that, whereas just in your thoughts that wouldn't be a sufficient description. I agree with you that these things are problems. I agree with you that these types of research can be oversold.

Sometimes it's not even based on research. There's an argument made about a dopamine response and there's no paper that looked at that dopamine research. It's just a shorthand because it involved a system that also is involved in dopamine release and therefore it's a dopamine response. So, I think there are multiple places that this comes from. Honestly, some of it is science journalism. It's a good shorthand or it's an easier way to communicate impactfulness, to make it cooler, and sexier, and from the brain, and with these chemicals that do these amazing things. Some of it is marketers trying to communicate within the field that the findings that they've made are impactful, so you have neuromarketing consultancies that want to impress upon their clients how effective their technologies are, and so they're trying to describe scientific results in a way that's catchy. You know, they're marketing their marketing.

And some of it is the shorthand that we use. Let me take a tiny bit of responsibility. I absolutely give talks where I will briefly allude to the fact that I'm simplifying what FMRI does, and yet I will then talk about this area of the brain lit up as if that's magically the only thing that's happening in the brain at the time. So, communicating the nuance is not always as impactful as giving these shorthand heuristics and we know that heuristics are attractive, and we know that they don't lead to as deep processing. See? I read my social psychology too. And so, they're gonna be effective, and sometimes more effective to the point that they overwrite the nuance that they were intended to communicate.

You haven't asked but I could anticipate the question on how to best prevent these things from happening, and I don't know is the correct answer.

Andy Luttrell:
Ah. Bummer.

Uma Karmarkar:
I think that a lot of us have made an effort, us meaning people who do this kind of interdisciplinary research, have made a direct effort to try and be responsible in the way that we communicate, certainly in the scientific research communities, in our papers, et cetera, in addition to that communicating with the press, communicating with companies in this way. I will also say that there was a fascinating counterpoint, for lack of a better word, that was brought up by a professional who works in the neuromarketing space. So, this was a person who works for a neuromarketing company, and they came to an academic conference and one of the things that they mentioned is that Coke doesn't reveal their formula. And so, when a neuromarketing company is trying to tell someone why something happened, they don't present all of the EEG traces. They just say, "This person was paying attention because the brain told us so."

And as long as it works, that is as long as they are sufficiently successful above existing metrics in improving their clients' sales, or advertising elasticities, or whatever marketing target goal they have, there's a really open question for some of the people who work in these firms about how precise the communication of the science needs to be. And that happens outside of neuroscience, too. That probably happens in many domains. So, I think that that's an understandable reason that some of these claims can get blown out of proportion.

On the other hand, on the other extreme, saying that you can tell what someone's thinking, or that you love your iPhone like you love your mother, or any of these other wildly, grossly overblown claims is of course inappropriate. The dopamine one really gets me because FMRI doesn't measure dopamine. There's no… Also, dopamine's, as you likely know, is an incredibly slow transmitter compared to everything else going on, particularly when we're talking about quick, pleasurable responses, and so it's just infuriating.

Andy Luttrell:
Yeah. Imagine people are thinking, "Yeah, I click a button, it just explodes in my brain."

Uma Karmarkar:
Like a firework.

Andy Luttrell:
Yeah.

Uma Karmarkar:
So, it's frustrating, and on the third hand, because the terminology has moved into the public space, it's now very attractive to use because it has its own meaning that people have interpreted. So, people will often say, "Well, can't we just say the dopamine response?" I'm like, "No, we cannot just say that." There's this thing called dopamine fasting, which had… I don't know if it's still as much of a fad in the Bay Area, but it took… There were several think piece articles, and there's this whole trend for a while of what was called dopamine fasting, and the idea really was effectively stimulus reduction, right? So, you either meditate, or you remove a lot of the outside influences that might have been reward giving like social media or something like that, so you kind of unplug in the most literal sense, or you just take a break from all these outside stimuli, or reward-inducing stimuli, or habit-inducing stimuli. And it was called dopamine fasting, and I'm going, "You know, if you actually managed to deplete the dopamine in your brain systems, you would have so many motor disorders coming out of that." Dopamine does all those… You know, there's all the cerebellar… There's a lot going on that needs dopamine that has nothing to do with buy buttons, or pleasure principles, or anything else. But it's its own marketing term now and I think that that's a real challenge.

Andy Luttrell:
And to your point about reverse inference, right? There's only some small handful of these neurotransmitters and other chemicals, and as you said, they're doing a lot of different things. There's a sort of a common currency-ish thing going on there where they're… depending on how they're used, and it just oversimplifies to go like, "Oh, one to one, when you have dopamine this kind of stuff happens as a consequence." To that point, I did actually want to ask a little bit about

these neuromarketing firms. So, as I think about how this overlaps with my interest in persuasion and stuff, and how people think about designing messages that appeal to the brain in whatever way, I don't have a strong sense of what these consultants promise to do, and how credible those promises are, so I imagine you have a little bit more insight on or more exposure to what these groups are about, and maybe have been directly involved in them.

But do you have a sense, what's the kind of thing that these neuromarketing consultants aim to provide for clients? And does it strike you as a purely snake oil business or there are ways of actually pulling that off in a credible way?

Uma Karmarkar:
I think there are ways of pulling it off in a credible way and one of the things that I should mention that we haven't actually touched on is how big you think the neuromarketing umbrella might be. Not you. How big we think the neuromarketing umbrella might be. Eye tracking is really useful. It tells you where people are looking. You can optimize a website, or an ad based on where people are looking to get their attention. It fits beautifully into all of the psychology that we know, right? Attentional psychology. If someone's looking at something, it probably either has value or will develop value for them.

A lot of neuromarketing consultancies offer eye tracking. I don't think a lot of what they're offering is that controversial in that domain, so it's a neuromarketing consultancy and they'll do reaction time. Again, reaction time, we use this in social, cognitive, all the psychologies use reaction time to represent effortful thinking, differences in cognitive processes, integration of more or less information fluency, et cetera. Oh, sorry, there's one more. Facial emotion coding, representing emotions through either algorithms that detect emotions from videos of people's faces or literal facial myography where you put little electrical contacts on people's faces and detect those micro twitches and whether they smiled or frowned.

I think most people don't actually think that that is snake oil. I think that the applicability and the inference that you could draw from that stuff seem reasonable. There's always a separate question of whether the companies are conducting the science in the way that a scientist might want to, but I think that those are less objectionable approaches in terms of perception of how the science is being done.

I think things start to get a little weird once we pull in EEG and FMRI, right? The actual brain signals. You can detect some interesting things with EEG. You can put a couple of people… You can put EEG scanners on a couple of people and have them watch a movie, or a trailer for a movie, and the degree to which their EEG signals correlate is a really good predictor of how engaging that trailer is gonna be for an overall population. To the idea of neuro forecasting, there are these neuro forecasting predictions that come from how similar people's brain reactions are to a piece of media. And it seems like you could probably do some really useful things with that. If everybody thinks about a piece of media the same way, it's probably gonna be more persuasive. And I think that's not a bad match with the way that we think about information processing, and similarity, and engagement in social psychology, either.

So, from building up in that way, it does seem like there are opportunities to create beneficial insights at the most applied firm level. Is it possible that some of these firms overpromise? Yeah, probably. EEG is noisy. You don't see a ton of FMRI in the neuro consultancies. Often they will draw from FMRI insights, or they will partner with scientists to come up with some of these outcomes and then use that information in developing practices and recommendations. The companies are very smart. They almost always use the full portfolio of techniques, so the neuromarketing consultancies will pair their EEG recordings with eye tracking and some of these other ideas to the point of the strength coming from the convergent data as opposed to use of any one particular piece of data.

So, I think there's significant potential for value there and I do think that there are firms that are working really hard to make sure that they make appropriate promises. I think there are advances in the technologies that we have. I'm gonna get the description of the acronym wrong, but fNIRS. Functional near-infrared spectroscopy. I think I got that mostly right, but that's a technique that's sort of a… Records from the surface of the head but uses FMRI type of signaling to get different kinds of information. So, the technologies are also getting to the point where they are more usable in these applied spaces.

So, the answer is all of the above into the multiple choice question you didn't ask, which is there are ways for these techniques to improve what's going on. There are definitely some firms that are overpromising. And then you get to the space of that comment that I mentioned earlier. Is the superficial overpromising just what gets them in the door to apply science that might actually be more effective? Or are they really just promising the superficial overpromising stuff and then not able to deliver the science that they're saying they're delivering? And that can vary across the market.

Andy Luttrell:
Well, and that's super helpful because you've made me quite a bit less reflexively skeptical of-

Uma Karmarkar:
No, no. Reflexive skepticism is great. I am a big proponent of reflexive skepticism because that makes me more enthusiastic when that boundary is crossed and it allows me some protection not only for me, but for the people that I recommend these techniques to, so please feel free to continue being reflexively skeptical.

Andy Luttrell:
Okay. I'll take that as license. Just an eye on the time, and I just wanted to say thank you so much for… We sort of riffed out and jazzed out on neuroscience and persuasion, and I had a lot of fun, so thanks so much for taking the time to talk about all this stuff on the show.

Uma Karmarkar:
It's my absolute pleasure. Thank you so much for having me.

Andy Luttrell:
Alrighty, that'll do if for this episode of Opinion Science. Thanks so much to Uma Karmarkar for taking the time to share her perspective. As always, check out the shownotes or the website for links to her website and the stuff we talked about today.

OpinionSciencePodcast.com has all the goodies you dream of—transcripts, photos, ways to support the show. And if you haven't already, please subscribe to this podcast. I promise, smashing the subscribe button is a dopamine release like you wouldn't believe. Follow the show on Twitter @OpinionSciPod, and if you or your brain are liking the show, tell other people about it. Be an Opinion Science Ambassador. Maybe I'll make a button for you.

Okay, that's it for now. Thanks so much for listening, and I'll see you in a couple weeks for more Opinion Science. Buh bye.