

Transcript: Like Everybody Else

When I was a kid, I really didn't care that much how I presented myself to other people. I didn't notice what other people were wearing or pay any attention to what was "in." I liked to wear shirts with horses on them, but otherwise I wore whatever was at the top of my closet. At recess, I alternated playing touch football with the boys and making fairy houses out of leaves and sticks with the girls. I cared that my friends liked me and that we enjoyed spending time together, but as long as I had people to play with, I didn't care about fitting in. It wasn't that I chose to be different or rebel against the norms or anything. I didn't care about being popular or "in" because, at my elementary school, no one was.

Unfortunately, once I entered middle school, my childhood attitude towards popularity and social conformity more or less evaporated. I moved to California during my seventh grade year and started at a much bigger middle school. Within two weeks of moving, I started wearing makeup to school for the first time. I agonized over acne and tried to dress like everyone else. With no established group of friends, I decided to pursue friendships with the popular girls. I thought I was chasing them because they were my type of people, but in reality, I think I wanted the social status and security that I imagined came with popularity. For a full year I pined after these friendships, helping them with homework and studying, with little success. Eventually I fell in with a different group of girls who became my best friends and gave up the desire to be popular; as long as I fit in with my own group, I was happy.

Interestingly, the older I get, the less I care about fitting in. It's still painful to be lonely, of course, but I'm no longer hyper-aware of my social situation and in what ways I differ from my peers. It's like everyone says: middle school is the worst, then high school is meh, and college is great socially. Today, I want to look into this progression in the brain: how does our brain development shape our social life from the end of childhood to the beginning of adulthood? We'll discuss peer pressure, conformity, and trying to fit in, as well as the male drive for dominance and the female desire for inclusion.

It has always confused me why teenagers are so social compared to adults. I'm pretty introverted, so I'm a little outside of the adolescent norm, but in general, I see myself and my peers interacting and socializing way more than any adults in my life. I used to have back-to-back sleepovers in middle school, easily. I would go to school and then hang out with my friends afterwards and on weekends because socializing with my small group of friends never got old. Even though I'm not a fan of big parties, I always love spending time with a few friends. My parents, on the other hand, might go to lunch with a friend or throw a small party every few weeks or so. Maybe once a month.

Turns out that our propensity for interaction is deeply rooted in the teenage brain. When looking at pictures of faces, teenagers exhibit more brain activity than children or adults. We are more sensitive to facial expressions and social feedback than people of other ages. This is true even among rats, who are far more social during adolescence than other life stages. Researchers from INSERT postulate that puberty drives us towards socialization so that we naturally learn about adult interaction, group living, and social hierarchy. Unfortunately, we can't be kids having play-dates forever.

One of the most interesting and potentially dangerous manifestations of our hyper-social brains is peer pressure. I usually think of peer pressure in the context of a beer-chugging competition or a high bridge to dive off of, but peer pressure can extend to any situation in which the presence of others influences our behavior. College students who scored high on a people-pleasing scale were found to eat more than low-scorers when offered candy in a social setting where others were eating candy. Of course, this principle extends to things like drinking and drug use, which you're all familiar with from school lectures. We all know that peer pressure exists and what it means, but there's one major misconception about peer pressure that I didn't know about until I began researching this podcast. Peer pressure doesn't only affect us teenagers when someone is criticizing or encouraging us to do something. At our age, peer pressure works in silence, and even works when the peer is invisible.

The most influential study to date about teenagers and peer pressure was conducted by Laurence Steinberg, of Temple University (his book is what originally inspired me to create this podcast- you can find it on our website). Steinberg created a timed driving simulation game in which participants encounter a series of yellow lights on a racetrack. The goal of the game is to finish the race as quickly as possible, and more money is awarded for a faster time. The participants can choose to drive through the yellow light and get a faster time and higher money reward, but if they run a red light, they will get a large time penalty. They can also stop when they see the yellow light, and have a slower race time but without the risk of running a red. When adults and teenagers played the game alone, they behaved fairly similarly. However, when the teenagers were told that a teenage peer was watching them through a video camera, they were much more likely to run yellow lights. This effect was not seen with adults, or when the teenagers were told that adults were watching them. Only the presence of another *teenager* changed the behavior of the teenage driver, and it didn't actually matter if that teenager existed (in the experiment, they lied about a person behind the camera). When we believe we are in the presence of our peers, we act riskier. I guess it's good that it's illegal for us to drive other teenagers in California for a year after becoming licensed. For 16 year olds, the risk of a fatal crash increases

by 40 percent with one teenage passenger, and 282 percent with three or more passengers. The more is not necessarily the merrier when it comes to teenagers and cars.

This study is interesting, but also puzzling. Why do we take more risks when another teenager is watching, even if they aren't pressuring us to take a risk? Why do we immediately jump from being watched to risky behavior?

The answer lies in the limbic system, which we talked about a lot in episode one. (For those who listened, I told you it'd pop up again). The limbic system is the reward and emotion center of the brain, and in teenagers, it's hyperactive. We are disproportionately controlled by this region of the brain, which seeks risks because they provide a reward for thrilling behavior- the chemical dopamine. What's incredible- and sort of terrifying- about dopamine is that, once we get some dopamine in our system, we crave more. It's like me and sugar- the more of it I eat, the more I crave it, but if I go for a few weeks without eating sugar I stop wanting it so much. We get addicted to many substances because of they give us more access to dopamine.

It turns out that in the teenage brain, social interaction with other teenagers causes our dopamine levels to spike. Unlike adults, teenagers show increased limbic system activity when we are told that our friends are watching us from another room. We even react more intensely to pictures of faces on a screen. And, if this weren't enough, researchers have observed this phenomenon in adolescent rats as well. When teenage rats socialize with other rats, the chemical changes in their brains are nearly identical to the changes seen when the rats drink alcohol. Basically, we teenagers have the unique superpower of getting drunk on friendship.

Being around friends gives us a dopamine rush, and, like sugar, that initial rush makes us crave more. And more. And more. And where can we get more dopamine? Well, we could listen to great music or dance or listen to comedy shows. Or, for more intensity, we can take risks, drink, do drugs, and have sex. Teenagers aren't more likely to drink in the presence of friends because they have irresponsible or bad friends. It's because, when our friends are around, our brains crave dopamine, and alcohol gives it to us. (Believe it or not, teenage rats also drink more when they're around their friends.) Driving through yellow traffic lights, like in the driving experiment, gives us this same dopamine rush. This is why peer pressure is more intense during adolescence than childhood or adulthood.

The true nature of peer pressure is sadly unknown to most parents and teachers. Unfortunately, peer pressure is a misleading term for what happens, because it makes it seem like we all go around pressuring our friends into taking risks and

doing things they'll regret later. I'm sure this happens among some friends, but more often, our brains feel the pressure of their own cravings, not the words of our friends. Remember that, when you're around other teenagers, your brain is in dopamine-search mode. It's looking for a higher high. You don't have to lock yourself in a closet to avoid making bad decisions, but just remember that you're more vulnerable to making decisions you might regret later when you're around your friends. As the beer commercials would say, Interact responsibly.

Peer pressure, or peer-induced dopamine cravings, push us to do new things and seek more rewards. But peer pressure has implications in our social lives outside of risk-taking, in the desire to belong and conform to groups norms. Conformity gets a bad rap in today's "be yourself" society. We've all laughed at the Mean Girls mantra, "On Wednesdays we wear pink" because of how ridiculous it is. Though most of us don't feel pressure to coordinate our outfit colors, we humans are all master conformists. In fact, we conform constantly without even knowing it. In social interactions, humans unconsciously adapt the speech rhythm, speed, and body posture of our conversational partner within seconds. We even adopt subtle versions of accents when talking to people from different regions or countries. I can attest to this one: we had a boy come to our school from Virginia, and within weeks I was using the word "y'all" for the first time in my life. Speech conformity doesn't seem all that important, but it actually gives us social advantages: people do more favors for others when their speech patterns closely match in conversation. Researchers at Drew University have proposed that verbal mimicry was vital to early humans, because without standardized language, people relied on shared verbal and nonverbal cues with which to communicate. Those who did adopt similar cues could not communicate with each other, and were unable to join cooperative groups and tribes. In short, they died. This is a scientific theory, not proven fact, because our ancestors are dead and we can't study them, but current studies of mimicry and cooperation support the theory.

The desire to conform and give into peer influences peaks at age 14, right around the time that puberty is drawing to a close. This would, evolutionarily speaking, be the prime time for adolescents to venture out in search of new tribes, to find mates in neighboring territory. In order to communicate with and form bonds with members of new groups, it would be advantageous for teenagers to be talented conformists. We no longer search for new tribes at age 14, but puberty still signals us to pull away from our parents and relatives and form new relationships. At the same time, young teenagers are trying to form a unique, personal identity. Psychologically speaking, young teenagers are dealing with a lot: they must separate from their parents and find an autonomous identity, all the while meeting new people and forming peer bonds. Laurence Steinberg, who conducted the aforementioned driving game study, suggests that young teenagers are not yet ready to form a totally unique identity, but must separate themselves from family.

So, they gravitate towards the norms and identity of a peer group. As we get older, we become more autonomous and self-aware, so we feel less of a need to identify with social groups. Middle school sucks for a reason.

We all get launched into the same peer-dominated mindset during puberty, but the way that boys and girls react to adolescent social life is different in some key ways. In fact, you're probably already familiar with them, without knowing a thing about neuroscience or biology. During the teenage years, boys naturally seek to climb the social pecking order in search of dominance, while girls desire social inclusion and belonging.

In boys, the craving for dominance is catalyzed by testosterone, the same hormone that triggers muscle building and facial hair. Testosterone levels in boys skyrocket to twenty times their childhood level during puberty. At Duke University, a study found that boys with high testosterone levels are more likely to be considered socially dominant by their peers, and have a higher place in the social pecking order. According to the New England Research Institute, a typical man with high testosterone "expresses his opinions forcefully and his anger freely, and... dominates social interactions." He isn't necessarily violent, but he is aggressive in his interactions with others. It's important to note that testosterone can promote good behaviors, like leadership qualities, or bad behaviors, like delinquency and drug abuse, depending upon a person's environment. Your hormones act within the bounds of your environment.

Before researching for this episode, I thought testosterone's main behavioral function was promoting physical aggression. When my brother used to come home with bruises from a certain rough friend of his, I thought this meant his friend was shot up with testosterone. However, studies of testosterone levels and adolescent behavior actually don't support this. According to research at Duke and the University of Montreal, the most physically aggressive boys actually have lower than average testosterone levels. Testosterone makes boys seek dominance and higher rank in the pecking order, but there is no link between testosterone levels and physical violence. The only place where I could find high testosterone and violence going hand-in-hand is among prison populations, as demonstrated by researchers at UT Austin. However, the researchers don't believe that testosterone *causes* the violence; instead, testosterone causes the search for dominance, and prisoners are more likely to be raised in environments where violence is the only path to social dominance. So, if you're a boy raised in a neighborhood where throwing punches is the way up the social ladder, you're likely to throw punches during the teenage years. But if you grow up in a neighborhood where being captain of the sport's team is the path to dominance, you're more likely to give it your all on the football field.

Another important point about testosterone levels: they seem to rise and fall based on your environment. The level of testosterone decreases when men get married, probably because they no longer have to prove their dominance to find a mate. As soon as a man gets divorced, his testosterone levels increase. Over the male lifespan, researchers are still trying to understand the relationship between testosterone and behavior. As of right now, it seems like they cause changes in each other, each influencing the presence of the other. For teenage boys, testosterone levels do depend on environment and behavior, but puberty will dependably increase testosterone levels in boys, leading to a desire for social dominance. For more information about testosterone and environment, there are some fascinating articles that you can find on the Brainstorms website on this episode's page.

As teenagers, boys' social brains are primarily concerned with climbing the social hierarchy in order to feel dominant among their peers. Girls, too, have a biological drive to become popular, but in a totally different sense of the word. While boys seek popularity as a source of social authority, girls seek popularity for a sense of belonging.

Teenage girls are infamous for forming cliques. We are also infamous for doing everything possible- including wearing pink on Wednesdays- to avoid social rejection. If this seems shallow or superficial, consider this: the pain of social rejection in teenage girls is so similar in the brain to actual pain that Tylenol has been shown to reduce the pain of rejection. And I bet that if you asked a 15-year-old girl if she would prefer to be ostracized by her friends or break her arm, she would choose the latter. I know I would.

Teenage girls not only get especially hurt by rejection, but are incredibly sensitive to perceived rejection. We may react to small things, like being left out of a group text message, with the same anxiety of outright social isolation. No experiment illustrates this phenomenon better than the Cyberball experiment, conducted by INSERT. In this experiment, female participants were told that they were playing a game of virtual catch with two other players on the Internet, represented by cartoon figures. In reality, the other players were computer algorithms, pre-programmed to pass to each other more often than they passed to the female player. Teenage girls playing the game, aged 11-16, reported significantly lower moods after playing the game compared to adult women. On a neurobiological level, the teenage girls showed more activity in the emotion and pain regions of the brain after the task. They also expressed less activity in the prefrontal cortex, which rationally regulates moods, than adults, indicating less ability to rationalize their pain. This is an affect that we see in all teenagers in various situations, because our prefrontal cortex is not fully developed yet.

Cyberball has shown us that teenage girls are incredibly sensitive to peer rejection, and cannot regulate this pain as affectively as adults. Girls, compared to boys, are also much more sensitive to social evaluation and judgment. At INSERT, a group of researchers studied the brains of children and teenagers when using an Internet chat room. The girls showed an age-related change in activity in many brain regions involved in emotion, which peaked during puberty. This affect was not seen in boys. The researchers attribute this affect to the incidence of anxiety and depression in adolescent girls, which is more than twice the rate of these disorders in adolescent boys. We will talk more about this in episodes to come.

All of this information about girls during adolescence helps us to understand why girls are likely to form groups and cliques, and to work so hard for social acceptance: the alternative, which is social isolation, is so painful that it can invoke clinically diagnosable mental illness. No wonder I was so keen on fitting in when I moved to California; my mental health depended on it. A little black eyeliner and helping other girls with their physics homework was not really me being superficial and concerned with popularity. It was almost a matter of survival.

Well, that was a bit of a knowledge-dump. Let's do a quick recap: Teenagers are, by nature, more social than children or adults, and more interested in relationships with peers than other age groups. Peer pressure is more prevalent in adolescence than any other age because we are especially sensitive to dopamine, and interactions with other teenagers fire up our dopamine systems, which crave more stimulation, often in the form of risks and dangerous behavior. Teenagers are also more prone to conformity than other age groups, because it helps us to form autonomous identities, and evolutionarily helped us to adapt to the customs and communications of strangers. Finally, boys and girls both care about social status and popularity, but in different ways; while testosterone promotes social dominance in boys, girls are more concerned with belonging and are more likely to be pained by social rejection. All in all, we can confidently say that social life during teenage-hood is a battlefield- not just a brainstorm, but an every-aspect-of-life storm. At the same time, we get to experience the feeling of belonging and solidarity more strongly than anyone else. We naturally gravitate towards each other and feel the pleasure of social interaction. We can use our brains to incredible advantage at this age, to band together on sports teams, in clubs, and in order to promote social change, as we see on college campuses all the time. We just have to remember that, until we become adults, we are more susceptible to making risky and stupid decisions around our friends. This doesn't mean you shouldn't have fun with your friends, but you should be aware that your decision-making skills are not as strong when you're around other teenagers. Take care of yourself, and remember that if life sucks- if you feel like a social outcast or a bench-warmer in the game of life- it doesn't last forever. I have yet to meet

someone who thought high school was socially superior to college. We'll all get there.

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