

Captain Dorito and the Bombshells: Hypersexuality in Marvel Comic Characters¹

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At the 2017 conference of the Northeastern Evolutionary Psychology Society, attendees were given the charge to “Do something different. Think outside the box and do something that you have not done before. Explore a little bit.” I also felt particularly compelled to do something new because I was the one who came up with the charge. I was getting bored with mating preferences and that sort of thing and so I said, “Okay, we are going to do something different. Let’s talk about something I love, but that I do not do a whole lot of research in.” To choose something I loved was easy; that would have to be comic books. I have loved comic books for decades. I have enjoyed mostly mainstream titles, particularly Marvel. Like most girls, I got involved in comics through X-Men and all of the various crossovers in different books that you get when you read *X-Men* comics; *X-Force*, *Generation X*, *DV8*, *Excalibur*, *Uncanny X-Men*, etc., but when it came to comics, what did I want to research? When I looked at comics as a biological psychologist, what I really started to notice in the comic book panels were markers of testosterone, markers of estrogen, and just how exaggerated they can become in comics and in film. I also wanted to look at sexualization in costuming, so I did this work with my co-author, Laura Johnsen of Binghamton University, SUNY. For those of you who are comic book nerds, you are going to think, “I know this, I have seen this a million times. Comics are sexualized.” What I will do is give you the numbers to support all of those observations that you have.

COMIC BOOK CHARACTERS AND THEIR BODIES

Let us start with Captain Dorito. Have you seen the Captain Dorito meme? The meme is essentially this: someone noticed Chris Evans in the movie *The Avengers* (2012) and the fact that his shoulder-to-waist ratio is actually that of a Dorito. How hypermasculine is this? He is the shape of a Dorito. They are not the only ones who noticed. This not only became a very popular meme, but people started creating fan art, people started cosplaying as Captain Dorito, then Robert Downey Jr. started calling Chris Evans “Dorito.” Interviewers called him the “human Dorito.” It went meta. He ended up on a bag of Doritos. There are pictures of him with the Doritos, and there are interviews of him being called

a Dorito eating the Doritos. It became this multi-layered combination of meme and reality (<https://fanlore.org/wiki/Dorito>). I thought, “There’s a reason this has caught on. Let us explore this Dorito. Let’s see just how exaggerated this becomes.”

The main point here is that this is not new. If you look at our fertility statues and sculpture, this is not new. There has always been this emphasis of masculine and feminine features in art and sculpture. It is actually not surprising at all that comic book and film depictions of men and women are what we would call sexualized or hypersexualized. One could argue it has become more exaggerated in recent decades, but part of the reason for that is because the technology that can create these exaggerated, supernormal stimuli is now possible. Even though we have always had this preference for very masculine male characters or feminine female characters, actually being able to effectively exaggerate those preferences and create supernormal stimuli is a relatively new thing.

We have done this in art but also in clothing and uniforms. Costumes and uniforms have long emphasized the same characteristics: shoulders and chests for men; breasts, waists, and hips for women. Look at just about any military uniform; there is padding in the shoulders and cinching at the waist. There are chest medals and shoulder epaulettes and all sorts of things to make the chest and shoulders look as broad as possible. All of these accentuations are done to make this person (usually a man) look as dominating as possible. Female military uniforms and fashion do not necessarily do that; instead, they accentuate the curves; they cinch tighter at the waist and incorporate tightly fitting skirts. The preference for the shapes has always been there. You can see those shapes even back in the 1940s with early comic books like *Captain America* and *Superman*. But it does not get as exaggerated until you have the technology to make that happen. Think of Batman in the 1960s, wearing what is essentially a leotard; now think of Batman of the 1990s, with molded muscles and eight-pack abs. Technology has allowed us to make exaggerated supernormal stimuli. We have technological improvements in costumes that make people look really physically fit when in reality they are not. Paul Rudd is actually really open about this. He says he did not try to work out at all for *Ant-Man and the Wasp* (2018) and used his stunt double. He was sucked into a costume that made him look like he was fit when he actually was not. The costumes can actually create muscles and curves. It is important to note that we as viewers know this, but we do not really care, do we? There were nipples on the Batsuit, as if Batman’s nipples could pierce through his costume and make indentations in his armor. This is ridiculous. We acknowledge this, but we still enjoy it. There are actors who do physical training and watch their nutrition to make themselves more masculine or feminine without even wearing a costume, and even these clearly very-hard workers can be helped with airbrushing or computer-generated imagery (CGI) when needed.

The improvement in CGI after the millennium created the opportunity to bring those supernormal stimuli to film in a realistic way. It can now meet the expectations that people have regarding superheroes

and their abilities. It is still bad in some areas, but, particularly in the early Spider-Man and Daredevil films, the CGI for superhero movement was not nearly as realistic as it is today. Even in 2015, there is one scene in *Avengers: Age of Ultron* where Thor is fighting the “bad guys” in a forest. It is obvious that the filmmakers sped up the film. The pacing completely changes, so they really are working every year on the technology to make it look as realistic, hypermasculine, hyperfeminine, or hyperviolent as possible. It is getting better every year. Fast forward to 2019, and we have entire cities, battlefields, and realistic characters created with computers, and characters (using human actors) aged or ‘de-aged’ to fit a storyline. Watch any behind-the-scenes footage, and you will see that a huge percentage of what you are watching was not there during filming.

We have also seen improvements in the materials of comic books like the paper, printing quality, and the amount of time the technology takes to print comics. Over the past sixty or seventy years, we have much better printing technology, better inks, better paper, and a larger industry of talented artists. All of these factors allowed artists to create more detail, which means more muscularity and elaboration in comics. Particularly, you really start to see it in the 1970s to 1980s, with a huge increase in the 1990s. Once you start getting to the nineties, you even have special editions with holographic covers. As I said, the *preferences* for the body shapes have been there for millennia, but the *ability* to create and mass produce hyper-muscular and detailed drawings have not.

Looking at heroes and heroines throughout the decades, you clearly see the waist-to-hip ratio and curves of the hips of the female characters starting in the 1940s and 1950s, when these characters originated. You see more detail now in Catwoman (a DC character) but the curves have always been there. You see the same thing with Spider-Woman, Black Canary (a DC character), and Black Widow. Throughout the same decades, you see it with males as well. The shoulder-to-waist ratio has always been exaggerated with the typical V shape. It is really obvious in Namor because he typically does not wear much clothing. As you move through the decades, you start to see more details in print. The body shapes are always there, but the amount of detail that you have in the drawings really comes out as you start moving into the 1980s and 1990s (http://thedorkreview.blogspot.com/2014/07/robs-room-comic-book-characters_16.html).

We do not have to just look at the characters; we can actually measure them. I am a Marvel fan, so that is why I chose those characters over DC. The Marvel Universe by itself has over 17,000 characters, so I did not need to do the DC Universe as well. As I was doing the research, I had to go and find all of these characters, so I used marvel.com, comicvine.com, and fivethirtyeight.com. I compiled all the characters and got rid of as many duplicates as possible. Now that we have the population, we can start breaking this down. How many are male? How many are female? Over 70% of the characters are male, so there are about 12,500 male characters and fewer than 5,000 female characters. This ratio is not

surprising. You can pick any superhero group and there are usually three men and one woman. The remaining percentage of characters do not have any gender or sex listed.

If you are going to measure bodies, you are going to have to get very specific about what bodies you are measuring. For this, I looked at what I call “humanoid forms”. Characters can be anything, even amorphous gasses, cosmic entities, teleporting bulldogs, dragons . . . and let us not forget Peter Porker as Spider-Ham (<https://en.wikipedia.org/wiki/Spider-Ham>). I had to eliminate all of these as well as children (because I am studying adult bodies), floating brains, evil cows, half animals, robots, sentient beings like The Darkness and Dormammu (how could you possibly measure Dormammu?), and Marcus the diabetic gladiator centaur werewolf with a symbiote and robot legs ([https://marvel.fandom.com/wiki/Marcus_\(Centaur\)__\(Earth-616\)](https://marvel.fandom.com/wiki/Marcus_(Centaur)__(Earth-616))). As I went through these characters, even if they have a particular adult humanoid form, I saw that some did not fit the human scope as a group. This would include gods who are 1200 feet tall and weigh 30 tons. They have humanoid bodies but not on a human scale. This would include Norse Gods as well, depicted in Marvel comics as the Asgardians (Thor, Odin, Loki, Friga, Valkyrie, Hela, Volstagg, Sif, Heimdall, etc.). Weight in Asgard starts at about 400 pounds. When I put that into a sample of humanoids, it throws everything off. As a group, Asgardians and other gods (Greek, Roman, etc.) are out. If a god takes a human form like Donald Blake (Thor) for example, we can use those measurements. Then there are situations where one character is different superheroes throughout their storyline. Betsy Braddock has several different superhero aliases (Psylocke, Captain Britain, Lady Briton, Lady Mandarin, Revanche, Kwannon). There are all of these different characters but only one body, so she is counted as one body. A character like Iron Fist is one important character, but eight different people take on the mantle of being the Iron Fist at various points. In this situation, I needed to measure all eight different bodies. Do you see how complicated this gets? This is the fun of research. I have to map out these characters to avoid counting them incorrectly. If the body changes in size and morphology, like Bruce Banner and the Hulk, it is counted as two bodies, and I have not even gotten to alternate universes. I did this going through a database of 17,707 characters. I ask you, “Who wants to do research? Who wants to go to graduate school? It is super fun!” To be honest, though, I actually had the best time doing this, even if it took hours and hours of sorting through characters. You remember characters that you forgot existed, like dear, sweet Marcus.

Once I got through those 17,000 characters and selected out the appropriate humanoid forms, I had to find heights and weights for all of them. How does someone even do that? Marvel actually records some of these heights and weights. Back in the day—twenty years ago—characters had trading cards, with all of their important statistics on the back. I am sorry to tell any collectors out there, but the cards do not have any monetary value today. You can go to comic book shops and ask, “Do you have any of these trading cards?” And they say, “Oh, for the love of God, just take them!” These cards, along with Marvel

databases and all sorts of other sources, give you the data you need. Any discrepancies in measurements were investigated and determined by the majority of sources.

After compiling all possible characters, 70.6% were male (12,495), while only 24.1% were female (4,276). A small percentage (0.3%) was listed as agender and the rest did not have a gender/sex listed. I found 3,200 heights and weights; 2,100 of them were male and 900 were female. There are some that were not listed as having a gender, but that group was not large enough to do anything with statistically. For my sample, I narrowed it down to heights and weights for 3,000 characters.

Heights begin at twelve inches, Pip the Troll, for example, and end at twenty feet tall. I know it sounds strange to have humanoids range from a foot tall to twenty feet tall, but these characters were not in any categories that would be excluded. I checked all the outliers; they were not gods, demons, or robots, and they still fit under that humanoid category. The mean height for all characters was five feet and eleven inches, so almost six feet tall. Men were about six feet and one inch on average. Women were around five feet and eight inches. Looking at the standard deviations for both groups, men had a far greater range in height.

Weight ranged anywhere from 12 pounds to 2,750 pounds (heaviest man), with a mean of 213.3 pounds. The heaviest woman was actually 750 pounds (that is Big Bertha and we will discuss her later). Typically, men were around 245 pounds, and women were 133 pounds on average. The standard deviation for male weight was over three times greater than for female weight. When you look at just these numbers, you immediately see that men have a much greater range in who they can be and what their bodies look like.

HEIGHTS AND WEIGHTS FOR COMIC BOOK CHARACTERS				
	MALE	SD	FEMALE	SD
Height (inches)	73.1	10.4	67.5	6.4
Weight (pounds)	244.9	199.2	133	64.3

Figure 1. Average Measurements for Comic Book Characters

Taking those heights and weights, I calculated each character's Body Mass Index (BMI). In this sample, you have BMIs ranging from 8.22 to 317.76, with a mean of 27.84. Anything under 18.5 is classified as underweight, and anything between 18.5 and 24.9 is normal weight, 25 to 29.9 is overweight, 30 to 35 is obese, and 35 and above is morbidly obese. Men on average have a BMI of 30.8 (SD 16.85), making them obese in the Marvel Comic Universe. What you see for women is at the low end of normal weight at 20 (SD 4.23). Looking at the medians, the middle of the road, men's BMI is 26, and women's

BMI is 19.76. What you see of course is that men are much bigger, and women are much smaller. Now, remember how the Asgardians are special? What is amazing is that the BMI for a typical male Asgardian, like Thor, is 70! How does the ground not just crack under his feet? For women in Asgard, it is still 53. This is why I give these characters their own separate graph. As mentioned earlier, all of these data tell us that there is a much wider range for males. For both groups BMI differed significantly by sex ($p < .001$; $p < .05$).

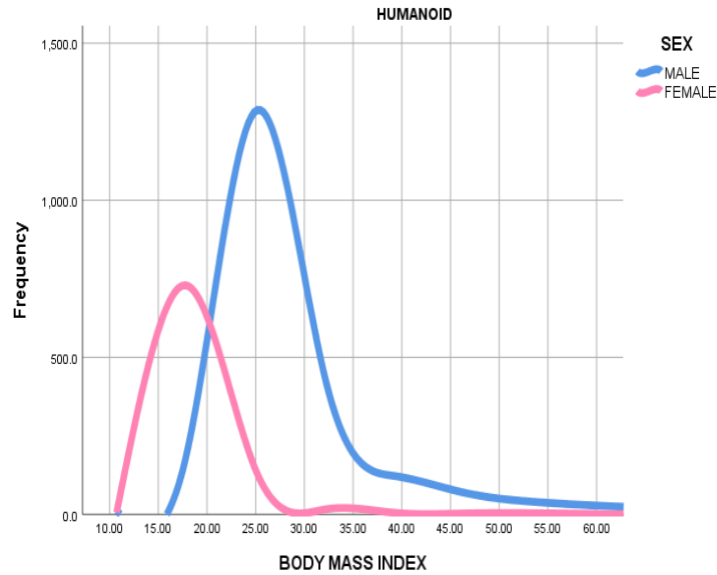


Figure 2. Distribution of Body Mass Index for Humanoid Marvel Comic Book Characters

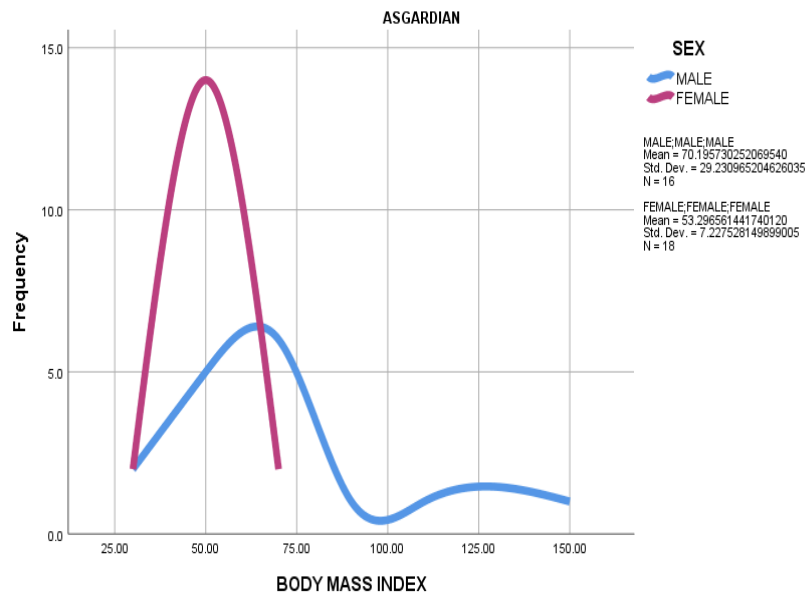


Figure 3. Distribution of Body Mass Index for Marvel Asgardian Comic Book Characters

Looking at these numbers, you might think, “How does this compare to ‘normal’ people?” This is where you start to see a huge difference in what comic book characters are versus what comic book readers are. There are some underweight men in comic books, sure, but between one-quarter and one-third of comic book men are way beyond obese. What we have for the women is quite amazing. In the United States, we have about 3% of women who are underweight. In the Marvel Comic Universe, one-quarter of female characters are underweight. Almost all of the other women are in that normal weight range. We are talking about 95% of women coming from a healthy weight or underweight category. Obese women in America total 25%, compared to 2% of the comic women. The contrast is really quite amazing.

BMI CATEGORIES				
	% Underweight (BMI <18.5)	% Healthyweight (BMI 18.5–24.9)	% Overweight (BMI 25.0–29.9)	% Obese (BMI >30)
US Men (over 20 yrs)	0.9	39.3	39.9	19.9
Marvel Comic Men	2.2	33.8	37.0	27.0
Asgardian Men	0.0	0.0	0.0	100.0
US Women (over 20 yrs)	2.9	45.9	25.7	25.5
Marvel Comic Women	23.7	69.6	4.7	2.0
Asgardian Women	0.0	0.0	0.0	100.0

Figure 4. Body Mass Index for Comic Book Men and Women and for Men and Women in the United States over Age 20.

CAPTAIN DORITO

Comic book men are obese, but not in the way we think of obesity. Most of the men are muscular, unless you have a power that revolves around obesity like the Blob or Slug. In very few instances have heroes been depicted as anything but hyper-masculine.² As one commentary put it, “The massive yet sharply cut musculature of men evokes steroid use when drawn by most comic book artists. Some male physiques seem only possible with chemical enhancements.”³ There is, for lack of a better term, enormous pressure to be muscular if the character is a hero. Even heroes with paralysis are still extremely muscular. I have to mention Charles Xavier. This man has been paralyzed for decades, yet he is very muscular ([https://marvelcomicsfanon.fandom.com/wiki/Charles_Xavier_\(Earth-1210\)](https://marvelcomicsfanon.fandom.com/wiki/Charles_Xavier_(Earth-1210))). You can see the complex muscles in his calves, but he cannot use them. There is no need to draw his calves like that; he does not use those muscles, and they are unrelated to his superpowers. But he is a hero, and heroes are muscular. That said, these male characters have a much greater physical range than female characters. There are a whole host of characters who are big and little. You have little chubby ones like Foggy Nelson in *Daredevil* and baby Bucky Barnes before he became the Winter Soldier. These characters do

not fit the hero-is-muscular mold because the men are allowed a lot more variation in character and body. You have the big men like Kingpin and Juggernaut and the little men like Pip the Troll or Toad. The range is vast: human and Asgardian males have BMI standard deviations four times greater than females.

Another way to examine comic book bodies is looking at the different testosterone markers that you see in these male characters. Male characters have exaggerated testosterone markers including angular jawlines, brow ridges, larger noses (compared to females), and a great deal more upper-body muscularity. These figures with high testosterone also have high shoulder-to-waist (the V shape) and waist-to-hip (straight line from waist to hips) ratios. These markers of higher levels of testosterone are not only drawn, but the costumes also exaggerate them: accentuation of the broadness of the chest, jawlines, and shoulders (capets, epaulettes, large jackets), the flatness of the stomach (skintight costumes with belts, abdominal accents), small waists, and large legs and footwear (boots, pockets, holsters). There is a joke in the Marvel Cinematic Universe that Chris Evans's costar is his jawline. The director of *The Avengers*, Joss Whedon, actually discussed this in the film's commentary. Comic characters have jaws at such sharp angles that they come to a point. In addition, they have masks and helmets that create sharply angled jawlines and cheekbones. The longer you look at these figures, the weirder they get. With this increase in detail, this hyper-masculinization, muscles are coming out of nowhere. There are male characters with a dozen flexed muscles in their necks, 24-pack abs, and multiple shoulder muscles that do not exist in human bodies. With these huge shoulders and upper bodies, the heads are dwarfed in comparison.

Let's measure these bodies and get an idea of just how absurd they are. How do we measure them? There are some challenges because although superhero costumes are usually skin tight, many have shoulder accents, capets, and other obstructions. These have a point, of course: to accentuate and extend the shoulders. Some of them are enormous. Cable (<https://www.marvel.com/comics/discover/811/cable>) and Stryfe, for example, have enormous shoulder accents. To accurately measure the shoulder-to-waist ratio, we need to find depictions of heroes without armor, epaulettes, or accents. Where do we find these depictions? One almost unbelievable source is the Marvel Swimsuit Special Issue. These were yearly issues where superheroes would go to far-off places like Wakanda, Madripoor, or even space, and each page had a centerfold-like depiction of a superhero in a tiny swimsuit. These issues came out between 1991 and 1995, so we also have to go beyond these depictions and find comic panels from the Silver Age (from about 1956 to about 1970) to today.

Laura Johnsen and I selected drawings and comic book panels on the following criteria: shoulders and waist drawn at same angle/perspective; edges of shoulders and waist clearly visible, not obscured by armor, belts, or drape; arms drawn in a downward position; and both arms drawn in the same position. Panels had to span the Silver Age and contemporary depictions as well. Measures were then taken from the widest points of shoulders and narrowest points of waists. Overall, we collected 204 pictures of male

characters. Shoulder-to-waist ratios ranged from 1.69 to 2.86 (waists ranged from 35% to 59% of shoulders). The mean shoulder-to-waist ratio was 2.175, or a waist that is 46% of shoulders. The median was 2.12, or a waist that is 47% of shoulders. To give this some perspective, in bodybuilding, the “Adonis Ratio” is 1.618. The target shoulder-to-waist ratio for body builders does not even reach the minimum shoulder-to-waist ratio of the comic book sample. Chris Evans, Captain America, has a shoulder-to-waist ratio of 1.75 without his uniform, and 1.87 in his uniform. This shows us a few things. First, that it takes a huge amount of investment and work ethic to create a Marvel hero’s shoulder-to-waist ratio (this is far above 1.618), and second, that costumes are clearly made to accentuate shoulders and create a larger shoulder-to-waist ratio.

What may be surprising is that Chris Evans does not even have the largest shoulder-to-waist ratio. We took film stills or screen captures from Marvel films, not from posters or candid shots outside of filming. Images from posters can be photoshopped, and candid shots outside of filming cannot be verified in terms of time/date or training regimen. What we found from the Marvel Cinematic Universe (and we added Henry Cavill from the DC Cinematic Universe) is the following: none of the actual humans reach the average comic book hero shoulder-to-waist ratio. Star Lord (Chris Pratt) does not reach the minimum.

Comic Character	Actor	SWR
Kilmonger	Michael B. Jordan	1.95
Black Panther (uniform)	Chadwick Boseman	1.89
Winter Soldier (uniform)	Sebastian Stan	1.84
Superman	Henry Cavill	1.83
Thor	Chris Hemsworth	1.81
Captain America	Chris Evans	1.75
Spiderman	Tom Holland	1.70
Star Lord	Chris Pratt	1.64

Figure 5. Comic Characters, Actors, and Shoulder-to-Waist Ratios

It is important to remember that there is little-to-no difference between the actual humans and the comic book characters in terms of height. What is different, to the point of absurdity, is the difference in specific markers of testosterone: upper body muscularity and shoulder-to-waist ratio. If this is how exaggerated male characters are, how exaggerated are female characters?

THE BOMBSHELLS

In our Marvel database, 70.6% of the characters were male (12,495), while only 24.1% were female (4,276). DC has 1,967 female characters out of 6,897 (28.5%), according to fivethirtyeight.com. This is not surprising when you look at superhero teams; there are usually three or four men and one

woman, and this has been highly criticized for years. Some companies have tried to remedy this. For example, in 2015, Marvel created A-Force, an all-female team. It lasted until 2016. Moreover, unlike males, many female comic book characters are not heroes. Women are often defined by three roles: nurturer, romantic partner, and victim. To be fair, there are some male characters who are not heroes; they are sidekicks or assistants. However, sidekicks often have superpowers as well. Female characters are different in that they are often not superpowered and just serve as a mechanism for the hero to be in danger or on a mission (to save her from being victimized). Indeed, whether women are nurturers or romantic partners, they are also victims. This greatly reduces the number of heroines in comics.

Even when women are heroines, they are limited or viewed as just a female version of a male character. Heroines are also often literally female versions of male superheroes with a “she,” “woman,” “lady,” or “girl” added to the name. There are at least sixty of these characters, with hundreds more female versions of male characters with the same powers (for example, Siryn as a version of Banshee, Lady Deathstrike as a modified version of Wolverine). Figure 6 lists a few of them. You will notice that one-third of these characters use the term “Girl,” fourteen use “Lady,” and only ten use “Woman.”

Female Comic Book Characters based on Male Characters (both Marvel and DC)			
Abominatrix	Element Girl	Lady Johanna Constantine	Owl Girl
Aquagirl (Mareena)	Flame Girl	Lady Mastermind	Power Girl
Aquagirl (Marquez)	Fly-Girl	Lady Octopus	Psycho-Woman
Baroness Blood	Franken-Doll	Lady Sonar	She-Dragon
Baroness Zemo	Fury The Goblin Queen	Lady Spellbinder	She-Hulk
Batwoman	Hawkgirl	Lady Stilt-Man	Sister Superior
Bombshell	Hawkwoman	Lady Supreme	Spider-Girl (Corazón)
Brainiac's Daughter	Icegirl	Ladyhawk	Spider-Girl (Parker)
Bride of Frankenstein	Impossible Woman	Lightning Lass	Spider-Woman
Bulletgirl	Iron Woman	Madame Libertine	Stargirl
Calorie Queen	Lady Blackhawk	Miraclewoman	Sungirl
Chameleon Girl	Lady Bullseye	Miss Arrowette	Supergirl
Cyborgirl	Lady Chronos	Miss Miracle	Superwoman
Doll Girl	Lady Clayface	Miss Sinister	Thor Girl
Dreamqueen	Lady Deadpool	Mon-gal	Tillie the Hun
Dynamic Woman	Lady Flash	Multi-Woman	

Figure. Female Comic Book Characters Based on Male Characters

Now that we see the representation of women in comics, how are they depicted? As we have already seen, female characters possess a specific body size: 5 feet 7½ inches tall (SD 6.4), 133 pounds (SD 64.3), and a BMI of 20.2 (SD 4.23). We would expect that if male bodies are exaggerated on testosterone markers, female bodies would accentuate estrogen markers: small waist-to-hip ratio, larger breasts, thicker hips and thighs. Most women are drawn with large lips and eyes, small chins, and extremely thick, long hair. All of these are markers of high estrogen as well. Female costumes are often depicted with specific accentuation of the waist, with small belts/sashes and lines and color changes to exaggerate these curves. Most are depicted wearing high heels, which shift balance to accentuate hip and buttock curvature.⁴ A cursory look at our sample of drawings found that almost 90% were drawn wearing high heels. Female costumes are either skintight or show skin (or both), with cutouts on the arms, thighs, midriff, and in particular, on the chest to show cleavage. The irony of battle uniforms that serve no protective purpose has been pointed out several times in cultural studies.⁵ Some examples of these are what I like to call “combat bikinis;” their armor and costumes are little more than bikinis, with ammunition belts, holsters, or other weaponry attached. Sometimes the women actually get a cape or a hood, or thigh-high boots . . . you know . . . for protection. Another example is the “boob window;” women with full body costumes that have an opening specifically to display cleavage. There is no functional reason for this; in fact, it creates a vulnerable gap in the costume/armor in the vital chest area. Even when the costumes fully cover the female body, the costumes are so tight and thin that every bodily feature can be seen, including navels, dimples of the lower back, nipples, and ribs. And if costumes were not hypersexualized enough, there was always the swimsuit issue.

If female bodies and costumes accentuate estrogen markers, what bodily features change? Waist-to-hip ratio is a well-documented marker of estrogen. A waist-to-hip ratio of 0.9 for men and 0.7 for women correlates strongly with health and fertility (comic men average = .92). Women within the 0.7 range have optimal levels of estrogen. Waist-to-hip ratio is an accurate indicator of reproductive viability; a 0.1 increase in waist-to-hip ratio decreases the probability of conception per cycle by 30%. Women with high waist-to-hip ratio (0.8 or higher) have significantly lower pregnancy rates. Waist-to-hip ratio also increases after menopause as reproductive hormones decrease.

To measure the waist-to-hip ratio of the female characters, we had to go through depictions of women and select drawings/comic book panels on the following criteria: waist and hips drawn at same angle/perspective; edges of waist and hips clearly visible, not obscured by costume; and legs together to get true measurement of hips. Measures were taken from the narrowest points of waist and widest points of hips. Just as with male depictions, we found comic book panels from various decades and also found stills from films where the characters were depicted. We found thirty-five comic book characters that had film actresses to compare them.

Film actresses had waist-to-hip ratio that ranged from .69 to .83. That means that their waists were between 69% and 83% of their hip measurements. The same characters depicted in comic books had a range from .47 to .94. This means that for some characters, their waists were less than half of their hip measurements. Overall, film actresses had a mean waist-to-hip ratio of .71, which is pretty much where we also see Miss Americas, models, Playboy centerfolds, and such. For anyone interested in this type of work, I direct you to Devendra Singh, who spent much of his career studying waist-to-hip ratios.⁶ The female comic book characters, however, had far smaller waist-to-hip ratios. The average ratio for comic book women was .61, meaning that the waist was 61% of the hips. This is either caused by a very small waist or very large hips. In fact, we have to ask just how exaggerated this is. In another study I am working on, I measured porn star bodies. I searched the top porn stars listed on Pornhub.com for the year 2017. Anyone can look this up, actually. Pornhub has literally billions of searches each year, and it reports the most-frequently searched women in the world. What I found was that as the searches narrowed, the waist-to-hip ratio usually became smaller, and for the five most-searched female porn stars in the world, the average waist-to-hip ratio was .669. Comic book women are curvier and have smaller waist-to-hip ratios than the top porn stars in the world.

Of course this is not the only sexualized or exaggerated part of a woman's body. Researchers and readers have long complained about the size of comic book women's breasts. They are, in a word, enormous. Another word would be "disproportionate," particularly when compared to those tiny waists. There is a great deal of work to be done studying depictions of breasts in comic books, and it is difficult as breasts are three-dimensional features that can be hard to study in a two-dimensional medium. For example, breasts require chest and cup size measurements. For a two-dimensional drawing, we can measure and gather data on chest size, but anyone who has had to buy a bra knows that cup size needs a three-dimensional measurement. For this reason, we chose to look at a different measurement of breasts: their shape.

Plastic surgeons use particular measurement methods to determine optimal breast size and shape.⁷ Results of breast augmentation are evaluated using two-dimensional photographs of before and after the surgery. This measurement is called "lower pole ratio," and it determines what the most aesthetically pleasing breast shape, from a frontal view, is. It is essentially the shape of the breast and how the width relates to the length of the breast underneath the nipple. If you were to look at the breast and describe it in layman's terms, you would use terms like roundness, sagginess, boxiness, etc. Because these methods use two-dimensional photographs, we can use them to evaluate drawings of breasts as well. To give you some reference, the lower pole ratio of a circle is 1.73. However, breasts are not only not perfectly round, but to have a perfectly round breast is not aesthetically pleasing. Lower pole ratios well over 2.0 are considered too "boxy." The optimal lower pole ratio, according to medical doctor Eric Swanson, is in the range of

1.8. He offers postoperative models with lower pole ratios of 1.86 as ‘guides’ for women considering surgery⁸ and points out that the female figure on the Pioneer 10 spacecraft has a lower pole ratio of 1.8 as does the most popular Victoria’s Secret bra.⁹ We used fourteen characters shown both in comics and film that met the criteria for measurement and found that the comic book women have a lower pole ratio of 1.89, and the film characters (actresses) had a lower pole ratio of 1.87. This difference is not statistically significant, but what may be happening is that artists may be making breasts that are boxier than what is preferred, creating an exaggerated breast. This may be a trade off in drawing the breasts so large. We should also mention that we cannot determine whether the actresses in our sample had had breast augmentation surgery or had padded costumes. We will certainly be doing more research on this in the future.

UNATTRACTIVE FEMALE CHARACTERS

We have already discussed representation, but, with this emphasis on uniformly sexy and beautiful women, one might ask whether there are any female characters outside this particular “model” form. One online forum asked if there were *any* unattractive female characters who were not monsters or aliens. Fans could name only one: Callisto. A closer look at female characters allows us to find a few more, and I will review them, but most female characters who are categorized as unattractive are either old or overweight, and almost all of them are villains. While male villains may show variation in shape and size, villainesses are seldom shown as anything other than young, thin-yet-curvy feminine exemplars (Catwoman, Poison Ivy, Electra, White Queen). Let us look at a few examples, and to be honest, a few examples are all we have.

We do have a few older women we can examine. Although Marvel has older female characters, they are rarely superpowered and often serve as caregivers/potential victims/sources of hero pain. Many superheroes have mothers, grandmothers, aunts, maids, or housekeepers who are older women. These characters have few uses in the plot; some are victims, some are caretakers, but few to none have storylines that are separate from these roles. The issue is finding older women with agency. They seldom have story arcs of their own. For older women (post-menopausal or elderly) with powers, there appear to be three: Madame Web (https://en.wikipedia.org/wiki/Madame_Web), Hag (<https://www.marvel.com/characters/hag>), and Cassandra Nova (https://en.wikipedia.org/wiki/Cassandra_Nova). We see that older women with agency are villainesses. The interesting thing about this is that even if they are old or evil, or both, they have waist-to-hip ratios of young women. Take, for example, Madame Web and Hag. Both are villainous older women. Both have gray hair. They have waist to hip ratios of .51 and .59 respectively. They are curvy, sexy, bombshell older women.

If many older women with agency are villains, what about other outside-the-norm women? What about overweight women? Here we have a handful to examine: Black Mariah, Pink Pearl, Godkiller Super-Skrull, and Big Bertha. Black Mariah (Mariah Dillard) and Pink Pearl (Pearl Gross) are both overweight, both villains. Mariah ([https://en.wikipedia.org/wiki/Black_Mariah_\(comics\)](https://en.wikipedia.org/wiki/Black_Mariah_(comics))) steals from the deceased and deals drugs. She was introduced in *Luke Cage* in 1973 and reappears over the decades. She is described as using her extreme weight to hit with “respectable force.” Pearl is a circus attraction and terrorist ([https://en.wikipedia.org/wiki/Pink_Pearl_\(comics\)](https://en.wikipedia.org/wiki/Pink_Pearl_(comics))). She first appeared in *Alpha Flight* in 1985 and reappears (albeit rarely). Pearl is described as being “surprisingly strong and nimble for someone her size. Although not superhumanly durable, her body fat has enabled her to survive a knife being embedded in her chest.” Godkiller Super-Skrull is a villain, created as a monster assassin to kill Thor (<https://comicvine.gamespot.com/godkiller/4005-58494/>). She is given little in terms of a character storyline. She is, as they say, bred to destroy. The most interesting thing about Godkiller Super-Skrull is the text from one comic book panel that mentions a bit of her origin: “genetically modified to mimic the powers of four of Earth’s most epic titans: Thundra, Titania, Volcana, and Battle Axe. That these titans were all female was clearly a mockery of Asgard’s patriarchal organization. . . .” Godkiller Super-Skrull is a villain sent to destroy Thor, but this statement implies that she is also a feminist, a giant, murderous feminist.

There are two female characters who are not old or overweight but are (or were at some point) considered unattractive: Callisto and Marrow. Callisto (<https://comicvine.gamespot.com/callisto/4005-3423/>) was the leader of an underground band of mutants, while Marrow ([https://marvel.fandom.com/wiki/Marrow_\(Sarah_\(Earth-616\)\)](https://marvel.fandom.com/wiki/Marrow_(Sarah_(Earth-616)))) is a mutant who grows bones out of her body and can use them as weapons. Callisto was often seen as a mother figure for Marrow. What is interesting about these two characters is that they were not only connected by storyline (in the X-men genre) but that they share very similar arcs and depictions. For example, both were unattractive (but not old or obese), and both were drawn with small busts and high waist-to-hip ratios. Both were drawn with short hair and a haggard appearance. Both were villains. Both were given story arcs where they became good or heroic characters. When this happened, both became beautiful; waist-to-hip ratios shrank, breasts and hair grew, and complexions improved. Callisto for example, went from a villainous waist-to-hip ratio of .94, to a heroic ratio of .61. Marrow’s ratio decreased from .84 to .62. What are we to take from this? That becoming a good person makes you beautiful? We actually have a number of beautiful villainesses, so it is more like you cannot be a good person if you are unattractive.

Lastly, we have to discuss Big Bertha. She is enormous, weighing in at 750 pounds and possessing a BMI of 68.08 ([https://marvel.fandom.com/wiki/Ashley_Crawford_\(Earth-616\)](https://marvel.fandom.com/wiki/Ashley_Crawford_(Earth-616)))). But Big Bertha is unlike all of the others. She is a heroine. Part of the Great Lakes Avengers, she saves people,

fighters evil, and even goes out on a date (or tries to) with Deadpool. What makes Big Bertha so different? Bertha's superpower is the ability to control the fat in her body, making it possible for her to become absolutely huge. It is in this form that she is a crime fighting heroine. Bertha's secret identity, Ashley Crawford, is a supermodel; a very thin-yet-curvaceous supermodel with a BMI of 15.83. This is far below the cut off for underweight (18.5). So an overweight superhero is secretly a supermodel; she apparently cannot be a hero and overweight all the time.

This is not an exhaustive list of old, overweight, or unattractive female characters. For example, there is Thumbelina, a character from the Mutant Liberation Front. She is constantly made fun of by her colleagues for her size. There are several other bit players who get very little attention, although they could hardly be called overweight (although in comparison to the average, they are). One group in particular, a female wrestling group called the Grapplers, with characters like Poundcakes, should get more attention.

CONCLUSION

What do we see in all of these depictions of heroes and heroines? First, we notice that there are many more men than women and that these men are able to be a much larger range of shapes, sizes, and ages. What we start to see here, although not to the same extreme, is a "Smurf" scenario. There are several different types of characters that males can be, but females have one specific mold to fit into (in the "Smurfs," we have all sorts of male Smurfs with different qualities and personalities, but there is only one female character, "Smurfette"). We can see this with the standard deviations on height and weight (and, therefore, also BMI). Males have variance in measurements that is three to four times what women have. Women have a much narrower mold to fit into. While males may vary in age (Professor X, Magneto, Cable, Vulture), size, and attractiveness, it is extremely difficult to find older, larger, or unattractive female characters.

All of these data and all of these measurements show us the accentuation of markers of testosterone to the point of men being triangles on legs, and the accentuation of estrogen markers to the point where women are curvier than porn stars. These exaggerations have existed for decades but have increased over the past thirty years.¹⁰ The larger question is whether there is a limit to what is physically possible or aesthetically pleasing in comics. I believe comics have already reached this limit, and his name is Rob Liefeld. Rob Liefeld drew some of the most exaggerated characters in comics, particularly through the mid-1990s, and was roundly criticized for bodies that were so extreme they were difficult to even look at. Chris Knowles, in his book *Our Gods Wear Spandex: The Secret History of Comic Book Heroes*, described Liefeld's artwork as "Instead of sleek, idealized athletes, with colorful yet tasteful outfits, superheroes became a riot of bulging veins and ballooned muscles."¹¹ Some depictions were so

muscular they displayed muscles that humans do not even possess, like dozens of neck or forearm muscles.

In short, this has always been an exaggerated medium, but these exaggerations are not random or equivalent throughout the body. They are specific to creating supernormal sexual stimuli that sell and create profit. Comics are a business, and sexualized stimuli sell. They sell because they act on preferences and expectations of gendered bodies that have existed for millennia.

NOTES

1. The manuscript this talk was based on is now in print: Rebecca L. Burch and Laura Johnsen. "Captain Dorito and the Bombshell: Supernormal Stimuli in Comics and Film." *Evolutionary Behavioral Sciences*, 2019, <https://doi.org/10.1037/ebs0000164>.
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4. David MG Lewis, Eric M. Russell, Laith Al-Shawaf, Vivian Ta, Zeynep Senveli, William Ickes, and David M. Buss, "Why women wear high heels: Evolution, lumbar curvature, and attractiveness," *Frontiers in Psychology* 8 (2017): 1875.
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6. D. Singh, "Adaptive significance of female physical attractiveness: role of waist-to-hip ratio," *Journal of Personality and Social Psychology*, 65 (1993): 293; D. Singh, "Waist-to-hip ratio and judgment of attractiveness and healthiness of female figures by male and female physicians," *International Journal of Obesity and Related Metabolic Disorders: Journal of the International Association for the Study of Obesity*, 18 (1994): 731-737; D. Singh and S. Luis, "Ethnic and gender consensus for the effect of waist-to-hip ratio on judgment of women's attractiveness," *Human Nature*, 6 (1995): 51-65; D. Singh, "Female mate value at a glance: Relationship of waist-to-hip ratio to health, fecundity and attractiveness," *Neuroendocrinology Letters*, 23 (Suppl 4) (2002): 81-91; D. Singh, "Universal allure of the hourglass figure: an evolutionary theory of female physical attractiveness," *Clinics in Plastic Surgery*, 33 (2006): 359-370.
7. Eric Swanson, "A Measurement System and Ideal Breast Shape," in Eric Swanson, *Evidence-Based Cosmetic Breast Surgery* (Cham, Switzerland: Springer, 2017), pp. 19-31.
8. Ibid., p. 28.
9. Ibid., p. 29.

10. Harrison G. Pope, Jr., Katharine A. Phillips, and Roberto Olivardia, *The Adonis Complex: The Secret Crisis of Male Body Obsession* (New York: Simon and Schuster, 2000); Brenda L. Spitzer, Katherine A. Henderson, and Marilyn T. Zivian, (1999). "Gender Differences in Population Versus Media Body Sizes: A Comparison over Four Decades," *Sex Roles*, 40 (1999): 545-565.
11. Chris Knowles, *Our Gods Wear Spandex: The Secret History of Comic Book Heroes* (San Francisco: Weiser Books, 2007), p. 7.