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Measuring how much bras minimize bounce

In the 19th Century, women wore corsets to try to force the body into what was considered an attractive shape. In 1875, manufacturers George Frost and George Phelps patented the "Union Under-Flannel" a no bones, no eyelets, no laces or pulleys undergarment. In 1893, a woman named Marie Tucek patented the "breast supporter", the device included separate pockets for the breasts and straps that went over the shoulder which were fastened by hook-and-eye closures. In 1889, corset maker Herminie Cadolle invented the "Well-Being" or "Bien-être", a bra-like device sold as a health aid, the corset's support for the breasts had been squeezed up from below, Cadolle changed support to the shoulders down.

In 1913, the first modern brassiere to be awarded a patented was invented by a New York socialite named Mary Phelps Jacob. Mary had just purchased a sheer evening gown for one of her social events. At that time, the accepted undergarments were corsets, stiffened with whaleback bones and steel rods. Mary found that the whalebones poked out visibly around the plunging neckline and under the sheer fabric, so with two silk handkerchiefs and some pink ribbon, the first bra was invented.

Mary's new undergarment went well with the new fashions being introduced at the time and demands from friends and family were high for the new brassiere. On November 3, 1914, she was awarded a patent for the "Backless Brassiere". Caresse Crosby was the business name Jacob used for her brassiere production. However, Jacob did not enjoy the business, so she sold the brassiere patent to the Warner Brothers Corset Company in Bridgeport, Connecticut for $1,500. The Warner Brothers Corset Company made $15 million dollars from the bra over the next 30 years. The undergarment name "brassier" was derived from the old French word for "upper arm". Her patent was for a device that was lightweight, soft and separated the breasts naturally. It should be noted that Jacob's brassiere design was intended to flatten the breasts and not enhance them. Her invention didn't even have cups. Without publicity, her brassiere business was doomed to sag and Mary sold her company to Warner Brothers Corset Company for just $1,500.

Ida and William Rosenthal went into business as the Maidenform Company in the 1920's as a protest against the notorious flat-chested flapper girls of the Roaring 20's. Ida was the actual inventor of brassiere cups and designed bras for every female figure from budding teens to the mature matron.

The bra size of a woman is determined by measuring around the body, just under the arms, and above the breasts. You can double check the bra size by measuring around the rib cage, just under the breasts, and adding 5, unless the measurement under the breasts is 33 inches or above, in which such case, you add only 3. If the bra size is an odd number, add one. The bra size of a woman or girl is a measure of the circumference of her torso where she would wear a bra. The bra size of a bra is a measure of the length of the bra, or in other words, the bra size of a woman for whom the bra would fit.

In the 1920's, Ida Rosenthal was noticed that a bra that fit one woman did not another woman of the same bra size. This is because women have different sizes of breasts. Then she invented cup size. The cup size of a woman is determined by measuring around the body, at the point where the breasts stick out the most. Subtract the bra size from that measurement. If the difference is 0, the cup size is AA. If it is one inch, the cup size is A. If it is two inches, the cup size is B. If it is three inches, the cup size is C. If it is four inches, the cup size is D. If it is five inches, the cup size is DD. If it is six inches, the cup size is DDD or F. The cup size of a woman is a measure of how large her breasts are. The cup size of a bra is a measure of the volume of the cups of the bra, or in other words, the cup size of a woman for whom the bra would fit.

There are different reasons why women and girls choose to wear a bra. Part of the reason is cultural. In our society, girls are taught they should wear a bra. Part of the reason, is that some women feel more comfortable wearing a bra. Another reason is because some women think they look better while wearing a bra. A push-up bra is an extreme example of a bra that supposedly forces the breasts to what is considered a more attractive shape. Another reason is coverage. In our society, it is considered taboo for a woman's breasts to be exposed. By wearing an extra layer of clothing over her breasts, she prevents her breasts from being seen if she's wearing a tank top, bends over, etc. It must be pointed out that the idea that bare breasts

should not be exposed in public is a very recent concept, and is essentially limited to the United States. For instance, throughout most of the world, women go topless on beaches. However, another common reason for wearing a bra is to minimize bounce. This is especially true for sports bras. Sports bras were invented in 1977 by Hinda Miller and Lisa Lindhal, two Vermont joggers who were tired of their breasts bouncing with each step. One evening in Lindhal's home, a male friend pulled a jock strap out of a laundry basket and held it to his chest, saying, "Look, a jock bra." They made the first sports bra by sewing two jock straps together.

The female breast is comprised of mammary glands and fatty tissue covered by skin and attached to the chest wall by ligaments, which depending on the size and shape of the breasts, may not provide a lot of stability. While the jiggling and jostling during exercise won't hurt breast tissue, experts theorize that ligaments and skin might lose their elasticity and, over time, allow the breast to sag. "The other factor is comfort level during activity and minimizing motion," says Dr. Elethea Caldwell, a plastic and reconstructive surgeon at Strong Memorial Hospital in Rochester, N.Y. "If you have unsupported breast tissue moving around, it will be pretty uncomfortable." The snug fit of a sports bra relieves the strain on ligaments and eliminates excessive motion by compressing the breasts. Excessive bounce can be very uncomfortable. Another reason some women or girls are concerned about bounce is because it can cause unwanted attention from men or boys. This is especially a concern for girls at the junior high school and high school level who have co-ed PE classes.

However, surprisingly, currently there is no established method for measuring either how much a given bra minimizes bounce, or how much a given woman's breasts bounce, in other words, how much she needs her bounce minimized. Today, bras are only labeled according to bra size and cup size, neither of which give any indication of how much the bra minimizes bounce. The only way a woman or girl can find out how much a given bra minimizes bounce is to purchase the bra, wear it while playing sports, and then see how much it minimizes bounce. They are often disappointed. We have a situation similar to that which existed before the invention of cup size, in which women had no way of knowing ahead of time if a bra fit. A major problem is that there are many bras on the market that look like sports bras, and are sold as sports bras, but don't do very much to minimize bounce. Also, many women have need for a bra that minimizes bounce even if they don't plan on playing sports. This could be the secretary who has to run up stairs, or the student who has to run to class. It would greatly benefit women and girls if bras could be labeled according to how much they minimize bounce. Therefore I developed the following system for measuring how much a woman's breasts bounce, and how much a bra minimizes bounce.

Motion sensors are used in a wide variety of industries for recording and analyzing human movement. Here you can read about the history of using motion sensors on actors to create computer animated characters.

http://www.css.tayloru.edu/instrmat/graphics/hypgraph/animation/motion_capture/history1.htm

Have a woman or girl volunteer to be test subject for studying a specific type of bra. While the subject is topless, place motion sensors over her sternum (ST), right nipple (RN), and left nipple (LN). Then videotape the subject's breasts while she does jumping jacks for three minutes. Then for each motion sensor, calculate the average distance it moved per bounce by adding up the distances it moved for each bounce, and dividing by the number of bounces.

$$\overline{d_{ST}} = \frac{d_{ST_1} + d_{ST_2} + d_{ST_3} + \ldots + d_{ST_n}}{n}$$

$$\overline{d_{RN}} = \frac{d_{RN_1} + d_{RN_2} + d_{RN_3} + \ldots + d_{RN_n}}{n}$$

$$\overline{d_{LN}} = \frac{d_{LN_1} + d_{LN_2} + d_{LN_3} + \ldots + d_{LN_n}}{n}$$

Add the average distance moved by the right nipple to the average distance moved by the left nipple, and divide by two to obtain the average distance moved by both nipples (BN).

$$\overline{d_{BN}} = \frac{\overline{d_{RN}} + \overline{d_{LN}}}{2}$$

Now take the average distance that both nipples moved during each bounce, and divide by the average distance that the sternum moved during each bounce. The result is the natural bounce quotient (NBQ) of subject #1.

$$\text{NBQ} = \frac{\overline{d_{BN}}}{\overline{d_{ST}}}$$

The natural bounce quotient of subject #1 is written (1)NBQ. The higher the NBQ, the more bouncy the subject's breasts. The lower the NBQ, the less bouncy the subject's breasts. There is a relation between NBQ and cup size. Women with a higher cup size tend to have a higher NBQ, and those with a smaller cup size tend to have a lower NBQ. However, that is not always the case. The bounciness of a woman's breasts is determined not just by the size of her breasts but also how firm they are. There are some women who may have a higher NBQ but smaller cup size than another woman. Also, women with very large breasts actually tend to have a lower NBQ because their breasts are so heavy that they don't move as much.

Now have the subject wear a bra of the type you wish to study that is of the correct bra size and cup size for the subject. Make sure the bra properly fits the subject. Then repeat the above procedure. The result is the bounce quotient of subject #1 while wearing a bra of type a, written (1)BQ(a).

Then take the subject's natural bounce quotient, and divide by the subject's bounce quotient while wearing a bra of type a. The result is the bounce minimization factor (BMF) of bra type a, in regards to subject #1, written (1)BMF(a).

$$(1)\text{BMF(a)} = \frac{(1)NBQ}{(1)BQ(a)}$$

The higher the BMF, the more the bra reduces bounce. The lower the BMF, the less it reduces bounce. Keep in the mind that this is just the extent to which bra type a reduces bounce for subject #1. In order to make it independent of the subject, you must find the generalized bounce minimization factor (GBMF). Calculate the BMF of bra type a for 100 subjects. You could just take the average of those, but that would give equal weight to typical and extreme values. The values will tend to cluster around a single value. 68.3% of the values will be within one standard deviation of the typical value. Here you read the definition of standard deviation.

http://www.physics.csbsju.edu/stats/descriptive2.html

If you calculated the BMF of 1000 women, then 683 would be within one standard deviation of the typical value. However, it would probably be impractical to determine the BMF of 1000 women for each type of bra. Therefore, just determine the BMF for 100 women, and round it off to 68. Find the cluster of values, and define a set that includes 68 of the 100 subjects. The high and low values of the set will be within one standard deviation of the typical value. Find the value that is exactly half way between the high and low values of the set. That will the typical value that 68 values will be within one standard deviation of. This will be the generalized bounce minimization factor of bra type a, written GBMF(a). The GBMF(a) should be calculated separately for each cup size. Keep in mind that for subjects with a low NBQ, it is difficult to measure the extent to which a given bra reduces bounce since there is very little bounce in the first place. A woman or girl with high NBQ would need a bra with higher GBMF while for those with lower NBQ, it would not be as important a factor.

It should also be pointed out that even women with a high NBQ should not automatically purchase the bra with the highest GBMF, and bra designers should not try to design bras with the highest GBMF possible. Excessive bounce is uncomfortable and can cause medical problems but you don't want to go to far in the opposite direction. If the breasts are kept completely immobile and locked in place, that could also be uncomfortable, and is not necessarily the best thing for the breasts. Bounce should be kept to a minimum but the breasts should still be allowed some small freedom of movement.

I could imagine doctors and health clubs rigorously determining a woman's NBQ so she can use the information to select the correct bra. However, even women who don't determine the numerical value of their NBQ can qualitatively get a sense of it to help them choose the right bra. Let's say you have a 12 year old daughter who is active in sports. Does your daughter need a sports bra? You can't just go by whether she wears a bra in daily life since some girls wear a bra who don't need a sports bra while other girls don't wear a bra in daily life who should wear a sports bra while playing sports. You can decide by using the jiggle test. Have your daughter do jumping jacks while topless. If your daughter's nipples are moving significantly up and down in relation to her sternum, then she needs a sports bra. Also, by seeing how much her breasts bounce while she's doing jumping jacks topless, you can determine how much support she needs. Take her to the store, and have her try on different sports bras. Repeat the jiggle test while she's wearing each bra so you can determine how much it reduces bounce. The more bouncy her breasts are, the more her sports bra should minimize bounce. It's important for dads as well as moms to be involved. Fathers should be just as involved as mothers in deciding whether their daughter needs a sports bra, and then helping her pick one out.

A woman's or girl's NBQ is not the only factor relevant to what GBMF her bra should have. It is also relevant what activities she is planning to do while wearing the bra. If she is going to be doing high impact activities, she will need a higher GBMF than if she is going to be doing low impact activities. Here are some examples of low, med-low, med-high, and high impact activities.

Low - weight training, yoga, climbing

Med-Low - fast walking, road cycling

Med-High - step aerobics, mountain biking, basketball, volleyball

High - running, horseback riding, soccer, field hockey, lacrosse, high impact aerobics

I officially propose that the GBMF be determined for every bra sold in the United States and be clearly stated on the label and packaging. It would be of great benefit to women's health and comfort for this information to be available to the consumer.