



Texas 4-H

CONSUMER DECISION MAKING

Categories & Descriptions



2021-2022





Consumer Decision Making

Study Guide Additional Resources

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ATHLETIC SHOES

With the many types of athletic shoes that are available, it can be hard to choose the right shoes for you. There are differences in design and variations in material and weight. The American Academy of Orthopedic Surgeons says that these differences have been developed to protect the areas of the feet that encounter the most stress in a particular athletic activity. Let's review some of the different types of sports shoes available.

Athletic shoes

- Are grouped into the following categories: running, training, and walking; they include shoes for hiking, jogging, and exercise walking. These shoes should have a comfortable soft upper, good shock absorption, smooth tread, and a rocker sole design that encourages the natural roll of the foot during the walking motion. Features of a good jogging shoe should include cushioning, flexibility, control, and stability in the heel counter area, lightness, and good traction. Whereas, cross-training shoes combine several characteristics of other types of shoes so that you can participate in more than one sport and wear the same shoe. A good cross trainer should have flexibility in the forefoot that you need for running, in addition to stability on the inside and outside of the shoe for the control needed for aerobics and tennis. Walking shoes should flex easily at the ball of the foot, which help feet to push forward.

Court sport shoes

- Include shoes for tennis, basketball, and volleyball. Most court sports require the body to move forward, backward, and side-to-side. As a result, most athletic shoes used for court sports are subjected to heavy abuse. The key to finding a good court shoe is the sole. Ask a coach or shoes salesperson to help you select the best type of sole for your sport.

Field sport shoes

- Include shoes for soccer, football, and baseball. These shoes are cleated, studded, or spiked. The spike and stud formations vary from sport to sport, but they generally are replaceable or detachable cleats, spikes, or studs affixed into nylon soles.

Track and field sport shoes

- Are very specific to the sport. The needs of the individual are most important when picking the shoe. For example, foot types, gait patterns, and training styles should always be considered. It is always best to ask a coach about the type of shoe that should be selected for the event in which you are participating. Proper-fitting sports shoes can enhance performance and prevent injuries. Follow these specially designed fitting facts when purchasing a new pair of athletic shoes:
 - Try on athletic shoes after a workout or run and at the end of the day. Your feet will be at their largest.
 - Wear the same type of sock that you will wear for that sport.
 - When the shoe is on your foot, you should be able to freely wiggle all of your toes. There should be a thumb's width from the tip of the toe to the end of the shoe.
 - The shoes should be comfortable as soon as you try them on. There is no break-in period. If they're not comfortable in the store, they won't be comfortable when you're exercising.
 - Walk or run a few steps in the shoes. They should be comfortable. The heel of the shoe should not slip off the foot as you walk or run.
 - Always re-lace the shoes you are trying on. You should lace through each top eyelet as you crisscross the lacing pattern to ensure a more snug fit and decrease slippage. Don't tie the laces too tight as this may cause injury to the nerves or tendons on the top of the foot and ankle.
 - There should be a firm grip of the shoe to your heel. Your heel should not slip as you walk or run.

Now that you know what type of shoe to buy and tips to picking out a properly fitting shoe, you need to consider its construction—how well it was made. Understanding the basics of shoe construction can help you choose intelligently from among the thousands of available styles.

- Stitching should be secure, even, and straight. There should be no rough spots, wrinkles, bulky seams, or gummy adhesives.
- Rubber around the base of the shoe should be one continuous strip, tightly attaching the sole to the upper.



- The toe box should be square for adequate toe room.
- The shoe should have side and tongue padding for extra comfort. Cushioning on the cuff around the ankle and at the Achilles tendon helps to reduce friction and irritation.
- The inner sole should be soft and resilient, with adequate arch cushions.
- The reflector should be as big as possible, especially if you will be outside at dusk or dawn.
- The insole should be removable for cleaning and, when it loses springiness, replacement.

In addition to being overwhelmed by all the choices in athletic shoes, you may be surprised at how much they cost. Slick ads and television commercials tout technological features, the latest gimmicks, and shoes named after sports celebrities. Paying more than \$100 does not necessarily get you a better shoe. Good quality shoes may be pricey, but don't overlook the less expensive shoes because they can outperform their costlier brandmates. Be sure that whatever price you decide to pay for the shoes, it's because the shoe has the features that meet your needs—not because it is a certain brand or has a sports celebrity's name on it.

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ACTIVWEAR

Sales of activewear are at an all-time high. According to the market research firm NPD Group, activewear sales generated \$35 billion in 2014 and made up nearly 17% of the entire American clothing market.

Activewear is clothing worn for sport or physical exercise and uses the latest in performance fabrics and technology to ensure that apparel can stand up to the intense demands of sporting disciplines like running, cycling, swimming, and gym-work. Activewear includes tops, shorts, tights, socks, jackets, sports bras and so much more. The right activewear can enhance your training and performance. Fabric and fit are probably the most important factors when choosing activewear

FABRIC

Fabrics are designed for different purposes. Some fabrics pull sweat away from your skin and others absorb it. When it comes to workout clothes, some choices are better than others depending on your workout.

Wicking:

Wicking fabrics are breathable synthetic fabrics that provide moisture control for an athlete's skin during a mid to high intensity workout. In essence, the fabric "wicks" the sweat away from your skin which can help it evaporate quickly and keep your body cool.

Wicking fabrics tend to be soft, lightweight and stretchy, making them an excellent choice for activewear. This broad category of fabrics is used to make garments like T-shirts, sports bras, running and cycling jerseys, socks, and polo-style shirts for any physical activity where the goal is to keep your skin as cool and dry as possible.

Moisture-wicking fabrics are used to make apparel for outdoor activities such as hiking, fishing, mountain biking, snow skiing, and mountain climbing.

There are a number of products marketed for their wicking. Many of these products are used as a blend with each other or with cotton. Additionally, these products may be branded under a variety of names such as Dri-Fit, CoolMax, Vapor and Climalite.

1. **Polyester** - Polyester is the workhorse of the workout fabrics and is the one you see on labels most often. Basically plastic cloth, it's durable, wrinkle-resistant, lightweight, breathable, and non-absorbent.
2. **Spandex** - Also known as elastane and by the brand name Lycra, spandex puts the stretch in workout wear. The synthetic fabric can expand to nearly 600 percent of its size, offers an unrestricted range of motion, and then snaps back in place. Spandex is an anagram for expands.
3. **Emerging Performance Fabrics** - The next big thing in activewear is products that provide even more benefits. Benefits include improved wicking, temperature control, UV protection and anti-odor properties. Bamboo is an example of a new, emerging performance fabric. These products may also be more expensive.

Cotton:

Cotton can also be a good choice when choosing activewear. Cotton is a breathable, soft, comfortable and natural fiber that works well for lighter workouts. Cotton also tends to be less expensive than synthetic activewear. However, cotton is very absorbent and is slow to dry. When wet, cotton holds the moisture next to your body.

FIT

Choose activewear that fits your body and your workout. For example, if you are running or biking, avoid wide-leg or loose pants/leggings. Likewise, for activities such as yoga or Pilates, choose stretchy, fitted fabrics. Additionally, avoid fabrics that could chafe or irritate your skin during repetitive movement.

Pay closer attention to fit more than size because some workout clothes tend to run smaller and more form fitting than regular clothes.



COST

There are many factors to consider when shopping for activewear. You may be surprised at how much activewear costs. Paying the top dollar does not necessarily mean that you will get the best activewear for you. Be sure that whatever price you choose to pay for activewear that it is the right activewear for you and that it meets the needs you desire. <https://makersrow.com/blog/2014/08/powerful-tips-for-manufacturing-an-activewear-line/>



SUNGLASSES

Sunglasses can be a very important fashion accessory. But their most important function is safeguarding the health of our eyes by preventing damage from the sun’s ultraviolet (UV) rays. Most people, including children, should own a pair of shades, and in some cases, may need more than a single pair.

The National Eye Institute reports that an estimated 20% of cataracts cases are caused by extended UV exposure. In addition, UV exposure can cause macular degeneration which is the leading cause of blindness in the United States. In 1988, a study by Johns Hopkins University indicated that people who did not use some form of eye protection were three times more likely to suffer from eye ailments such as cancer of the eyelids than those who wore protective sunglasses. Most sunglasses will protect eyes adequately, although some styles do not include protective features. Nothing, including sunglasses, offers protection against the harm caused by looking directly into the sun. That includes before, during, and after an eclipse as witnessed in the United States in August 2017.

Choosing sunglasses for eye protection allows a wide range of choices. Selecting a pair of sunglasses based on wearer comfort and personal preference may be more difficult. Knowing what features are available will help in finding the best pair of sunglasses for the conditions in which they will be worn.

FUNCTION

Besides the infinite variety of fashion design and style, sunglasses offer a more valuable and practical purpose. Sunglasses can offer both protection and comfort for the eyes.

Eyes are bombarded with light rays of all wavelengths from the sun as well as from artificial light. However, much of the concern over eye health involves the shorter wavelengths, called ultraviolet (UV) light. UV light is further divided into two categories of shorter wavelengths (UVB) and longer wavelengths (UVA). Research has shown that UVB rays (the shorter of the two) have been found to cause more eye damage than UVA rays.

The main protection offered by sunglasses is filtering out these UV rays. How dark the lenses are does not determine how well UV light is filtered out. Blocking UV rays is often accomplished by adding chemicals to the lenses or adding a special coating. In fact, a clear lens with no tint and 100% UV protection is better for your eyes than dark, heavily tinted sunglasses without UV protection.

Sunglasses can provide other benefits than UV protection. Working or playing in bright light can cause the eyes to tire quickly or become fatigued. Wearing sunglasses while working in bright sunlight or brightly lit work areas can provide comfort and keep eyes from tiring quickly.

Sunglasses also provide some protection from dust, debris, and particles in the air. Sunglasses may serve to keep dirt from getting into the wearer’s eyes and becoming uncomfortable. This is especially true for people who wear contact lenses.

LABELING

Labels should reference that the sunglasses “block 99 to 100 percent of UVA and UVB rays” or “absorbs up to 400 nm of UV radiation.”

ANSI – The American National Standards Institute is a nonprofit organization that oversees development of voluntary standards for sunglasses and other products. More specifically, the reference to “ANSI Z80.3” is related to the blocking of UV rays, including UVA and UVB and the normal to strictest UV blocking requirements.

ISO – The International Standards Organization is an independent, non-governmental international organization that develops specifications for products, services and systems, to ensure quality, safety, and efficiency in almost all aspects of technology and manufacturing. Sunglasses may refer to or include labeling that includes ISO 8980-3 which relates to the “attenuation” of solar radiation (UV light). They may also be labeled with ISO 14889 as “...intended for driving.”



Examples of ANSI and ISO labeling requirements related to intended use and performance claims may include absorbing, reflective, tinted, polarizing, or photosensitizing lenses to attenuate light and reduce glare.

Federal labeling requirements (U.S. Food & Drug Administration) are completely voluntary but do allow for labels that claim the sunglasses may "...reduce eye strain and/or eye fatigue due to glare."

Some recommended standards:

- Block 99% of UVB light. A UVB-blocking sunglass is adequate to protect eyes in moderately bright sunlight such as that found in low-altitude, urban areas
- A UV-blocking sunglass blocks 99% of both UVA and UVB. A UV-blocking sunglass is adequate protection in very bright sunlight like that found in low-altitude snow areas and beaches. Such sunglasses should block 60-90% of visible light to adequately reduce glare and increase visual comfort. The lenses should allow you to recognize traffic signals accurately.
- To protect eyes during prolonged daily use in extremely bright sunlight, like high-elevation snow areas and equatorial sand beaches, a UV-blocking sunglass should block 92-97% of visible light and have side shields. Goggles are also acceptable. Side shields are needed in extremely bright sunlight to prevent UV rays and light from being reflected into the eyes. These sunglasses limit a driver's ability to accurately recognize traffic signals. Side shields should not be worn when driving because they eliminate peripheral vision.
- The only medical claims allowed on sunglasses are that they prevent cataracts and photo keratitis.

FRAMES

Frame materials are generally made of plastic, nylon, metal, or metal alloy. Frames should be considered for form and function. They should also be comfortable and sturdy. You should always check your frames to ensure they have not been bent or warped out of shape during storage or transport. The frame's primary function is to hold the lenses. They should not interfere with or block the wearers vision, including peripheral. Labeling of the frame material may be a bit absent for the lower-end frames.

- Plastic frames are generally the most affordable option
- Acetate frames are a form of plastic are a bit stronger, more flexible, and lighter than standard plastic frames. They come in a huge variety of colors and textures. The color tends to stay because it is embedded in the material not painted on like other plastics.
- Polycarbonate frames are very versatile, tough plastic with impact resistance and is used in many sports. Despite their toughness, they tend to be rigid frames and are not very flexible. These are good frames for children because they can really take a lot of abuse.
- Nylon frames are very resistant to temperature fluctuations, remain very flexible, but are stiff enough for safety. These frames tend to be less expensive, lightweight, and stronger than metal frames.
- Metal frames are commonly used due to its malleability, corrosion resistance, and ease of adjustability making it very easy to tailor to many face shapes. They tend to be more expensive, less durable, and not ideal for sports. Titanium frames are more durable but tend to be more expensive.

Frame size can vary greatly between manufacturers and styles. There are several measurements that are standard on eyewear, but not all sunglasses indicate the size of the frames. The frame size may be represented by three numbers (e.g. 52 – 18 140 MM or 52 - 18 140) located on the inside of the temple or bridge of the frames. The first number is lens width (52), then bridge width (18), and the temple length (140) in millimeters. Many sunglasses are marketed on a Small, Medium, or Large scale. Knowing the dimensions of your face temple-to-temple may be useful in this regard. The frames should be wide enough to not press on the temples. However, this makes it much more difficult to select a pair of sunglasses without trying them on, making internet purchases a challenge. Another size factor is the temple length. The temples should be long enough to rest comfortably over the ears. Proper fit for comfort and function are important.

Frame function refers to the style and purpose of the sunglasses. This is the broadest of variables in selecting your sunglasses. The wearer should consider the primary use of the eyewear to determine the best frame style. The frame style may also impact the type and size of lens it will accommodate. Some frame styles are not suited for glass lenses. One distinct style is the wraparound sunglasses. They are shaped to keep light from shining around the frames and into



your eyes. Studies have shown that enough UV rays enter around ordinary eyeglass frames to reduce the benefits of protective lenses.

Large-framed wraparound sunglasses can protect your eyes from all angles. Keep in mind that frames should not obstruct your vision, or side vision. However, the main criteria for frame style is wearer preference.

Frame color is entirely at the discretion of the wearer. As long as a style is comfortable, functional, and does not block vision, then color has no real bearing aside from wearer preference.

LENSES

The materials used to make sunglass lenses varies between glass, plastic and SR-91. In fact, there are many types of glass and plastic used as lenses in sunglasses. The most common materials are identified here. Finding a pair of sunglasses that are made of unique materials may make your decision a little more difficult. Consider doing your own research on variations of these more common materials.

Glass lenses have the best optical clarity and provide a greater resistance to scratching than other materials. However, they are much heavier relative to the plastic or SR-91 lenses. Another advantage of a glass lens is they are better at retaining their shape in extreme temperatures. Specifically, leaving glass-lens sunglasses on the dash of your car in direct sunlight on a sweltering day will likely not warp or change their shape unlike plastic lenses. From a technical perspective, glass lenses tend to be thinner than plastic lenses due to their refractive index range. This is important when you are purchasing prescription sunglasses. Vision that requires greater correction requires more curvature of the lenses which results in thicker lenses. Relative to plastic lenses, glass lenses will likely be thinner due to their better refractive index range. Nonetheless, the glass lens will most likely be heavier than its plastic counterpart. One very important disadvantage of glass lenses is that they can shatter or break on impact. This is important to keep in mind depending on the application and use. As a general rule of thumb, you can expect to pay more for glass lenses than plastic lenses.

SR-91 lenses are made from a proprietary resin-based material developed by Kaenon Polarized and are exclusive to their brand of eyewear. They are considered a luxury performance brand that has the highest rating of optical clarity and acuity. In addition, SR-91 lenses pass the high-mass impact ANSI

1.1.1 testing. The SR-91 material is very light, much like plastic lenses, and are good for sporting and long wear applications. One can expect to pay more for these types of lenses than any other type of lens material including glass or plastic.

Plastic lenses can be made from several types of plastic such as acrylic, polycarbonate, plastic polymer (CR-39), or polyurethane. In general, plastic lenses are lighter and provide greater shatter-resistance than glass lenses. However, they are more susceptible to scratches. Polycarbonate plastic lenses are the lightest of the plastics and are virtually shatterproof. This makes them exceptional choices for impact protection. The most common plastic used for eyewear lenses is CR-39. This material is light, has higher scratch resistance than other plastics, and low transparency for ultraviolet and infrared radiation.

Note: Infrared wavelengths are invisible and produce heat. Sunlight has low levels of infrared rays, and the eye tolerates infrared well. Some sunglass manufacturers make health claims for their products based on infrared protection, but research has not shown a close connection between eye disease and infrared rays.

Photochromic lenses can be made of glass or plastic. Also referred to as photosensitive lenses, they darken and lighten in response to the amount of available light or type of light. For sunglasses, this may be a valuable tool for situations where the amount of light varies. This would allow a lens to get darker in brighter light. The more direct sunlight they are exposed to affects how dark the lens will become. It is important for drivers to know that these lenses will not be as dark inside the vehicle because they are not exposed to as much UV light. This may cause eye fatigue on very bright days when glasses do not darken fully. Another important characteristic is that they darken more quickly than they lighten. This may create problems when moving from direct to indirect sunlight areas. While sunglasses by nature do have a specific lightness/darkness, this lens adds variability to a pair of sunglasses. This can be a very useful option for some



wearers, but not very commonly found on the market making it difficult to find.

COATINGS AND TINTS

Coatings and tints are added features that are added to lens in the manufacturing process or as part of custom lens retailers. Either way, there is a wide range of options that provide some value and style to the wearer in the appropriate situation.

Polarized lenses are specifically designed to reduce glare which is generally caused by reflected sunlight or artificial Light. Some of the most common sources of glare from bright sunlight could include light bouncing off water, pavement, glass, or other reflective surfaces. Polarized lenses also improve contrast because of the reduced glare. People involved in water sports and fishing have been taking advantage of the benefits from polarized lenses for many years. However, more and more outdoor enthusiasts have found benefit from the glare-reducing feature. Polarization is a coating or film that is added to a lens. This coating can be as part of the manufacturing process for sunglasses or can be added when ordering custom sunglasses as an added feature. Adding this coating at the time of purchase is only likely to occur among custom sunglass or optical retailers with the ability to customize lenses at the buyer's request. Your standard retailers will likely market sunglasses with a variety of styles and options with and without polarization since they do not have the ability to customize your pair of sunglasses.

Tinting is also a coating that is added to lenses. Tinting can have both aesthetic benefits or functional benefits to the wearer. If you are looking for style, there are several ways to tint lenses to make the special impression and just look great. As with other features of sunglasses, they can be purchased with as is or can be customized with specialty retailers that offer customization.

- Plain lenses are uniformly tinted throughout the lens and come in a wide range of tints or colors. The darkness of the lens has nothing to do with how well it blocks UV light, but it will make a difference in how much visible light gets seen. This may be important for eye comfort during prolonged time in bright sunlight.
- Single gradient lenses are tinted darker at the top and lighter at the bottom. They may be useful for tasks like driving, where the road is bright, but the dashboard is dark. They are not very useful for places like the beach where light is reflected up from the sand. They may also be useful when walking to avoid tripping, especially when going from a bright area (outside) to a darker area (inside). The difference in tint also causes the lighting to change as the wearer moves their head which may be annoying for some. Gradients can add a unique look or style to the wearer.
- Double gradient lenses are tinted darker at the top and bottom, but lighter in the center. These are very specifically designed for sports such as sailing, skiing, and tennis, where light comes in from above and below, but the center of vision has less light coming in. These glasses are not appropriate for driving, since they darken visibility of the dashboard controls. Like the single gradients, the changing of light with head movement may be annoying to the wearer.

Anti-Reflective (AR) coating is a thin coating that eliminates or greatly reduces reflections and glare that are created by the light reflected by lenses themselves. This can occur on the front or back of the lens. However, in the case of sunglasses, the more common use of AR coating is on the back (inside) of the lens. This coating eliminates glare on the inside of the lens that may occur from light coming in from the sides, top, or bottom of the frames. AR coating works better with plastic lenses but also makes them more susceptible to scratching. Combining AR coating with scratch coating may reduce this issue but adds cost to the lenses.

Anti-Scratch coating is a film or coating that can be applied to sunglass lenses that reduces the appearance of scratches on the lens. Anti-Scratch coating does not make lenses scratchproof, it only reduces the likelihood. Scratches can impair vision depending on the location and severity of the scratch. This coating can prolong the life of your sunglasses. They are generally not an expensive option to add to your custom glasses.

Mirror or Flash lenses have a mirrored or flash coating that is reflective on the outside (front) of the lens with metallic silver, iridescent, or colored appearance. The coating makes them appear like mirrors and typically give the wearer's vision a brown or grey tint. The mirror coating decreases the amount of light passing through the tinted lens making



them useful at high altitudes or in sand, water, or snow. One significant disadvantage is that they can scratch easily.

LENS COLOR

Lens color can be a dye in the lens or a coating on the lens. Color on coated lenses is more likely than dyed lenses to scratch or wear off. Coated lenses can be protected by the manufacturer through use of scratch-resistant layers. Overall, dyed lenses retain color longer.

Darkness of a lens determines how much visible light will be let in. No special instruments are needed for this—the wearer can tell just by looking through the lenses. If glasses are to be worn in very bright conditions such as for water sports, a darker lens is more practical. For everyday wear, a medium to light lens is usually enough and may be more versatile. The main point is to match the amount of tint to the purpose for which the glasses will be used.

At one time, amber lenses were claimed to be superior because they reduced “blue light,” or shorter light rays. Because amber colored glasses reduce the transmission of blue light, they are sometimes preferred by pilots or others who need enhanced clarity of distant objects which may be obscured by a blue haze. However, no studies have proven that amber glasses provide any more protection as it relates to eye health than other colors. The amber sunglasses are popular among skiers, hunters, boaters and pilots

Lens color makes little to no difference in effectiveness of eye health. The color preference of the wearer is the main basis for color choice. Gray colored lenses offer the least color distortion to the wearer. Because of this, they are preferred by some people.

Care should always be taken when selecting colored lenses when it comes to driving. Some colored lenses affect the way traffic signals appear to the wearer. Certain colors may affect not only the recognition of specific traffic signal colors but the transition of those signals.

QUALITY

Most sunglass lenses are made of plastic which are more durable than glass lenses. Plastic lenses are lighter than glass lenses, reducing the overall weight of the glasses. Plastic lenses scratch more easily than glass lenses but can be coated with an anti-scratch layer. One way to evaluate lens quality is to look for scratches on the lenses at the store. Many times, unpackage sunglasses on displays are handled by many people which can cause scratches. However, this might be a good indicator of quality if a certain style or brand have scratches on the lenses. If they are packaged and have scratches on the lenses, that could also be an indicator of inferior quality. Glasses that cannot survive transport without scratching will scratch easily in everyday wear.

Lens distortion occurs in both glass and plastic lenses. It means that looking at objects through the lenses causes the objects to look oddly shaped. In glass lenses, this may occur if the glass has been formed rather than ground. In plastic lenses, distortion may occur because of handling after manufacture. Either way, distortion is easy to detect. Find an object with straight lines (like floor tile) and look through the lenses at arm’s length and moving the lenses slightly up/down and left/right. If the lines warp or curve when you move the glasses, the lens is distorted. Cost is not a guarantee of distortion-free lenses or quality. Inexpensive lenses will often be free of distortion. All sunglass lenses must pass the Food & Drug Administration’s safety test for breakage.

COST

Where sunglasses are concerned, there is no direct correlation between price and performance. Effective, reliable, high quality sunglasses can be found among even the most inexpensive options.

The lowest priced sunglasses may be more prone to lens distortion or scratching, but both conditions can be determined by visual inspection and reading labels for protective coatings, construction materials, and ratings. High fashion and brand names may raise the price, and many times provide better labeling and information than lower priced options.



ACCESSORIES

As with most consumer products, a variety of accessories is available to go with sunglasses.

Retainers, cords, cases, pouches, visor clips, spare lenses, cleaning kits and more are all available for sale individually or come with eyewear purchases. There are infinite styles, sizes, colors, shapes, and materials of these accessories. Some of them add to the functionality of your sunglasses, while others prolong their life. Consider how the accessories add or detract from the value of your purchase.



HANDSFREE BLUETOOTH CAR KITS

Effective September 1, 2017 there is a new Texas law that bans texting while driving within the state of Texas will be punishable by a fine of \$25-99 for first time offenders, and \$100-200 for repeat offenders. According to the Texas Department of Transportation, 455 people were killed and more than 3,000 seriously injured in the state of Texas in 2016 in vehicle crashes related to distracted driving.

New technologies are offering a handsfree solution to prevent texting and talking while driving. There are a variety of products that enable drivers to speak aloud a text or email message, or listen to one being read, without having to type on their phones. There are a variety of aftermarket hands free Bluetooth compatible devices available to offer a safer option for cell phone use while driving. However, handsfree use of cell phones while driving is not considered risk free driving. According to National Safety Council, to stay safe you need your eyes on the road, your hands on the wheel, and your mind on driving.

Choosing Bluetooth Handsfree Car Kits for safer cell phone use while driving offers a wide range of choices. Selecting the correct Bluetooth Handsfree device for a car may be difficult depending on your preferences. Learning what features are available will assist you in picking the best device for the situation that it will be utilized. Many new cars come equipped with handsfree technology, however there are several aftermarket Bluetooth handsfree car kits available if your car does not come equipped with one.

FUNCTION

Depending on the design of the vehicle there is a wide range of styles and characteristics to handsfree mobile devices depending on the desired use of each device. Bluetooth Handsfree Car Kits can be as complicated or simple as the consumer chooses for their desire. Handsfree kits can be used with cell phones for comfort and improved safety. Bluetooth handsfree are used for handsfree communication utilizing Bluetooth wireless technology. For the devices to work, they still require a mobile phone. Bluetooth allows for easy phone calls. With your voice command on your cell phone you can also call people in your contact list by saying their name without having to scroll through your contact list. Also, utilizing your voice command on certain phones you can text people in your contact list without typing the text with your hands.

To set your cell phone up with a Bluetooth device is called “pairing”. To utilize a Bluetooth electronic handsfree device it must be Bluetooth compatible and the Bluetooth feature must be turned on. Prior to purchasing a Bluetooth handsfree mobile device for your car make sure that your phone does have Bluetooth. Most Bluetooth handsfree devices also allow you to stream music or audiobooks through your car speakers or the device itself. Music downloaded on your phone as well as Spotify, Pandora and more can be played directly from your handsfree device via your cell phone.

Navigation Systems and Siri can also be utilized through Bluetooth handsfree devices to assist with finding where you are going without having to use your hands to type in the destination.

Voice texting is dependent upon the app you choose to use on your cellular device. Most smart phones are either equipped with voice texting via car mode or other apps that can be downloaded. The Bluetooth car kit simply makes it easier to voice text while driving because of the speaker and quality of sound.

EASE OF USE AND COMPATIBILITY

The primary purpose of a Handsfree Bluetooth mobile device is to limit the distraction of a driver while they use their mobile device.

A minimum number of parts and accessories make utilizing your handsfree device much more pleasant and desirable. Usable controls should be well placed and easy to access without distracting you from driving. You want to be able to answer a call, hang up a call, or change the volume of a call with minimal effort. Voice activated commands are desired for handsfree mobile devices. Ease of use- needs to be easy to understand and set up.



Automatic pairing to a cell phone should be standard. You want to be able to pair your cell phone the first time and then it should automatically recognize your phone when you get back in your vehicle.

FEATURES

There are a variety of features that each individual Bluetooth handsfree mobile device offers. Some of them may be of use to you and others may not be of use to you at all. To have ideal use of your Bluetooth handsfree device, there are some feature that you may want to consider:

1. Multiple Connections- allows a user to have more than one device connected at the same time.
2. Caller ID- Shows who is calling. Some kits that have a LCD screen will have a caller ID that shows up in the dark to determine who is calling.
3. FM Transmitter- Allows music to be streamed from the phone, calls are heard through the car's speakers.
4. Energy Saver- Kit powers off if it has not been used for a certain period to save battery power.
5. Noise reduction- during a call, the device reduces outside noise and provides more sound clarity.
6. Call Toggle- enables user to toggle between more than one call at a time.

Battery life for each handsfree Bluetooth car kit vary among each individual device. Most car kits come with a charger to charge up the device for use. It is important to make sure that the device you choose either can be charged while in use or will provide the desired of hours that you anticipate to use of battery life.

CONNECTION

There are a variety of methods to connect your handsfree Bluetooth car kit to your automobile.

1. Connecting with USB- Some new model cars are equipped with a USB built into the stereo. Most electronic devices will allow you to access the audio through the car radio interface.
2. Connecting through Auxiliary In- Most new car stereos allow you to connect any device that can play audio into your stereo via an auxiliary port. This will not allow control of the device through the car radio but is a simple and easy method to hook up your handsfree car kit, if available.
3. Connecting through a Cassette Adapter- Some older car stereos that still have a cassette player can utilize this method of connecting to a handsfree device.
4. Connecting through FM transmitters- A good method to integrate your cell phone to a car without a direct connection method.
5. Aftermarket stereos- It is always an option to completely get a new head unit for your car stereo that may offer more modern technology. This method can be more expensive.

FM TRANSMITTERS

FM transmitters allow your cell phone to work as a radio station in your automobile. They connect to your car and play the music across the FM radio frequency. They provide a wireless solution and will work in any car that has an FM radio. Bluetooth Handsfree Car Kits with FM transmitters have pros and cons. The pros for car kits with FM transmitters are the following: compatible with any car with an FM radio; FM transmitters are universally compatible with any device with a (3.5mm) headphone socket; Control is through your media player, making it easy for passengers to also select music from your electronic device; most FM transmitters can transfer audio from other applications such as Google Maps or Spotify. Cons for Bluetooth Handsfree Car Kits with FM transmitters include: FM transmitters can suffer from interference affecting sound quality; will not integrate with car controls; most transmitters will not transfer information to car display; FM transmitters typically cost more depending on all the features available.

DESIGN

Portable Bluetooth handsfree units come in several different designs. Many of the devices can attach to your visor. It is important to make sure that those devices are slim so that they will not obstruct the driver's vision.

COST

There is a wide range of cost for Bluetooth Handsfree Car Kits. Reviews of these devices show that cost is not necessarily a direct correlation with the performance of the device. It just depends what features are important to the consumer and how much money they want to spend. The lower priced devices may not offer all the desired features but many lower priced products still prove to be useful and dependable to consumers.



HEADPHONES/EARBUDS

Whether you are watching videos or listening to music or podcasts, headphones and earbuds have become ever important accessory. Phones, for example, come with a set when you purchase them. They add that much value as an accessory that phone companies just include them in the box. The need for headphones (collectively all styles and models) are important whether you are at home, school, work, at play, or on the go. There are so many different applications for which consumers want and need sound delivered. Selecting the best pair of headphones is a very personal decision, but there are plenty of styles, models, and features that require the consumer to really do their homework before purchasing a set. Some can be very small and slip into a coin purse or shirt pocket while others can blow you away with amazing sound. Some come with wires and some without. Some consumers may even purchase multiple types/sets to suit different needs. Explore some of the styles and features and evaluate how they address specific needs and wants among retail consumers.



Figure 1: Headphones & Earbuds (Source: The Wire Realm)

Over-Ear

These styles are the largest within the spectrum of headphone models. This is in part because as an over-the-ear design, the cups cover the entire ear where the pads typically press up against the head. Another benefit in completely covering the ear is blocking outside sound and preventing delivered sound from leaking out. All of these have some important implications for the user and even others.

These headphones come in two styles that affect sound in a couple of ways:

- Closed-back headphones have a solid cover over the back of each earcup which helps keep sound in and helps block ambient noise. While that can be a great feature, blocking outside noises can prevent the listener from hearing things like “take out the trash” or “dinner is ready.”
- Open-back headphones have openings on the back of the earcup which are intended to give the listener a clearer and more natural sound. However, that design allows sound to bleed out which might disturb the person sitting in the airplane or library next to you. A benefit is that it allows the listener to hear ambient sounds that may be important to hear.

By design, the over-ear models are the largest, covering the entire ear. The quality of sound is likely better in these models than others, but they may come at some expense literally and figuratively. They tend to be more costly. They also can cause the ears to get warm/hot if used for extended periods of time.

These headphones come with adjustable headbands that connect the two earcups. They can come in a wide range of designs to include slim/sleek bands to wider, padded bands and everything in between. Depending on how they are worn, they can really mess up your hairstyle. Again, those become personal choices.



On-Ear

This style of headphone generally is smaller and lighter than its over-ear sibling. These models press directly over the outer ear instead of the head. Many consumers find them more comfortable than the over-ear models. Similarly, these headphones come in closed-back and open-back styles in order to create the same effects. However, since they only go directly over the ear and do not press against the head, they are much more likely to bleed sound out and let ambient noise in as compared to the over-ear headphones. This is primarily because by nature of them sitting on the ear, they do not create a seal against the head. Depending on the size/shape of the user’s ears, these headphones can vary greatly in this regard.



Figure 2: Over-ear (L) & On-ear (R) Models (Source: Crutchfield Corporation)

The headbands on these models are much like those of the over-ear, however, there are many styles that come foldable making it convenient for storage and protects them from damage when not in use.

In-Ear & Earbuds

By far the smallest models come in a couple of styles, the in-ear and earbud headphones. While very similar in appearance, there are some subtle differences that even have experts arguing how different they really are. Albeit small, it is still important to know the difference.

In-ear style headphones rest in the “bowl” of the ear, just outside of the ear canal. However, most styles include silicone canal tips. These enter the ear canal and create a seal with the ear canal to prevent sound from bleeding out and ambient noise from getting in. When comparing this style with its on-ear and over-ear siblings, the relative difference in effectively sealing in sound and blocking out noise can be very different. For ultimate comfort, some manufacturers even offer custom molded earpieces that fit perfectly in the bowl of your ear if you are willing to pay the extra price. That’s one way to create a sound seal and a way to keep others from borrowing your headphones.

Earbuds also rest in the “bowl” of the ear, just outside the ear canal. However, this style does not include the canal tips like the in-ear styles do. Manufacturers will include soft foam slip on covers to add comfort, but they do not provide a seal with the ear canal like the in-ear styles do. As one might expect, while some sound might bleed out, ambient noise or sounds can easily be heard when using earbuds. As was mentioned earlier, there are some advantages to hearing outside sounds. The most common way people acquire a set of earbuds are the white ones that come with the purchase of an iPhone®. Don’t believe that there is not a retail market for earbuds. They tend to be the most economical option and many quality products provide suitable listening pleasure.



Figure 3: Earbuds vs. In-Ear (Source: HiFi Headphones)

Some listeners may find these types of headphones uncomfortable if used for long periods of time. Consider the comfort level and time they will be used before making your purchase.

Many of these models also come with a wide range of designs to hold the earbud in place. For many, simply putting them in the ear as shows in Figure 3 is enough for them to stay in place. However, depending on the level of activity, "ear hooks" may be needed to keep them in place. There are a wide range of products available for the active listener that wants to listen while they work out, play sports, or do anything that may need to provide some support and keep them in place.

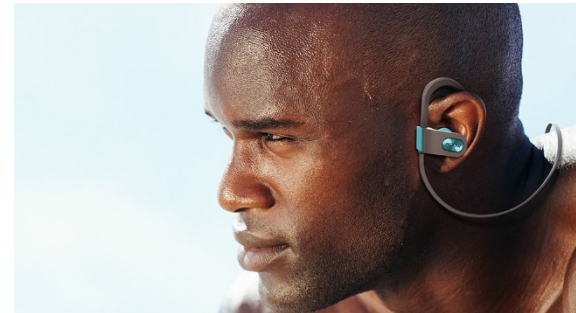


Figure 4: Ear-Hook Design

Sound Quality

Like speakers, headphones and earbuds can emphasize different parts of the audio spectrum and is very much a subjective quality measure. While there are some "accuracy" measures that can be evaluated with sophisticated instruments, consumers generally must rely more on enjoyability which is completely subjective. When it comes to headphones and earbuds, and specifically music, many people like strong, deep bass sound but hi-fi enthusiasts lean more towards accurate, natural sound. Which one are you?

Consumers should try them before they buy them. This requires driving to a retail outlet and listening to them and comparing them first-hand. It is also a good idea to take any music or audio with you for which you typically would use the headset. However, purchasing online without the ability to listen to them poses a bit of a dilemma. The best recourse in this situation is to evaluate the seller's return policy so that you can return them if you are not happy with them.

Over-ear and On-ear models, given their size, allow manufacturers to focus on the quality of sound rather than portability. Even so, you can still find relatively good quality sound ranging from \$20 to \$800.

Many models have on-board controllers that allow the listener to raise the volume, lower the volume, mute, pause, or advance music or sound on the headphones. These can add versatility to the device.

Size & Portability

The decision between In-Ear, On-Ear, and Over-Ear models must be evaluated against their intended purpose, holding other features constant. When portability is the most important feature, then the In-Ear/Earbud models will be a smarter choice. However, if the quality of sound takes priority, the larger Over-Ear or On-Ear models will likely be a better choice. It is important to consider that there are some high quality In-Ear/Earbud models that will provide better quality sound than the Over-Ear or On-Ear models. Look at your choices carefully before you make any rash decisions that will leave you feeling like you didn't get what you paid for.

Over-Ear models typically do not come foldable, making them bulky and difficult to stow compared to the earbuds.



However, many of the on-ear models come in foldable styles with a semi-hard case or bag. In terms of storage, will the consumer put them in a cabinet, drawer, backpack, purse, or pocket?

Within the in-ear/earbud models exist some that include a rigid or soft collar that lays around the neck with wired earbud/in-ear headphones. These styles can be foldable and may be easier to store than their larger over-the-head siblings.



Figure 5: Rigid and Soft Collar-Style In-Ear Headphones

Wired

The array of headphones and models that keep you tethered to a device will likely provide you with the best listening experience. While you get that at the expense of not being able to move further than the cord will allow, you virtually eliminate the instance of interruption of disconnecting from your listening experience. Consider the length of the cord provided with the device and the interface with the sound source. You can find them with 1/8" connector for some phones and computers. Some come with a 1/4" jack for sound systems and other professional uses. You can also find some with USB connectors for use with computers and other computer-based USB ports. Depending on the application, you will need to select the appropriate wired connection. While there are adapters between 1/8" and 1/4" connectors, it will be more difficult to find an adapter to convert those to/from a USB connection as the source or the headphones.

Don't assume that every corded headphone keeps you tethered to your home or office. You must remember that the cord can simply be between the phone in your backpack and your ears. Do not let the wired headphones keep you static. You can always get great sound on the move. The only thing keeping you tethered is the source of the sound, so your headphones can be as portable as your source.

Wireless

Wireless headphones provide the most freedom of movement with proximity to the sound source. The most common form of connection is with Bluetooth® technology. The standard range of Bluetooth is about 30 feet in an open space. Wires and cords can get in the way of active movement. The wireless options provide considerable freedom in that respect. However, if your activities separate you from your sound source beyond its range, you will experience interruption or disconnection from the sound. Even people or objects between your source and device can reduce the effective range of the connection.

An inherent part of any wireless headphone is the use of batteries to power the device. The best measure of battery performance is actual playtime. Unlike a wired device, wireless headphones must be powered to make the wireless connection. Larger over-ear or on-ear devices may be less efficient with battery usage while smaller in-ear models may boast up to 20 hours of playtime. Whichever model you choose, be aware of playtime, the amount of time it will take to recharge, and the interface with the charging device (USB, Firewire, AC adapter, etc.). In terms of size, larger models may have larger battery capacity compared to smaller ones. The key is to compare active playtime.

Reference to "true wireless" models continue to expand. Like the in-ear collar style models, there remains a wire connecting the two earpieces. True wireless headphones are especially portable but often have shorter playtime.



One final note about wireless headphones is that there are models that are BOTH wireless and wired. Keep a vigilant eye on device specs as this provides some great versatility for the consumer.

Noise-Cancelling

Noise-Cancelling (NC) technology is available in many models and provides some very important benefits. There is passive and active NC technology. Passive NC technology is based on the construction of the headphones including materials that help block ambient sound. Active NC technology are embedded circuitry that work off battery power to erase low-frequency sound waves including much of the outside ambient noise. Working in a noisy environment, like a train station lobby, can make it difficult to concentrate on your work. NC headphones are designed to cancel out that noise. NC-featured devices will likely come at a premium but may be worth the expense depending on the application and user.

Active NC headphones require power, and as described in the Wireless section, the key is to determine and compare active playtimes. Keep in mind that if you are using the headphones for short periods of time, playtime may be less of a factor in deciding between models and styles. In some cases, the NC technology can be switched off to conserve battery playtime.

The biggest challenge regarding NC headphones is to distinguish good NC technology from not-so-good NC technology, especially by reading the product packaging or specs. The best determination is to do a hands-on evaluation. Try them out.

Microphones

The integration of microphones in headphones can dramatically affect the versatility of any headset. For example, answering a call on your phone using your headphones might be a valuable benefit. Many professionals working at home may use headphones with mics to conference with colleagues across the internet. Gamers are especially attracted to earphones with mics. It changes the way they interact with other online gamers and gives them the ability to listen and speak clearly. There are a wide range of options regarding headphones with microphones. Some microphones may include their own NC technology to increase the quality of sound going through the mic.

In terms of design, some microphones are rigid and affixed to the earcups in the over-ear or on-ear models. The in-ear models generally house the integrated mic in one of the earpieces or on the cord connecting to the device. In the collar-style headphones, it may be integrated into the collar or the wires connecting the earpieces.

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TABLETS

A tablet computer, more commonly referred to as a “tablet” is a mobile computer system that has distinguishing characteristics that make it unique from laptop computers, desktop models, and even smartphones. More specifically, a tablet includes a full operating system with a touchscreen interface. The device includes rechargeable batteries and comes in a thin, flat platform and can have screen sizes that range from approximately 7 to 10 inches (measured diagonally). These devices are designed to be smaller than the laptop with similar function. However, they are also intended to be larger than smartphones to add productivity while remaining highly mobile, light, and agile.

Types of Tablets

- **Slate** – This type of tablet is typically in the smaller range of tablets. Their screen sizes can be as small as 5 to 6 inches, a bit below the standard 7 to 10-inch range for tablets. However, some slate tablets can be as large as 10 inches. The primary feature, or lack thereof, is that slate tablets do not come with a keyboard. Although you can typically add a keyboard as an accessory, the slate tablets are small, sleek, and are designed primarily for touchscreen interface (including on-screen keyboards) for accessing entertainment apps, watching videos or playing games that use the touchscreen interface. The touchscreen can be used using the finger(s) or even a stylus (likely not included at the time of purchase).



Figure 1: [Slate] Apple iPad 1st Generation (Released January 10, 2010)

- **Mini tablet** – This type of tablet generally weighs less than slate tablets and are typically have a smaller screen size as well. It is designed to be more portable than its larger version, but specifications can be different. Functionally, it is like the larger tablet and typically includes a touchscreen interface. Due to its smaller size, this type of tablet may be a bit more affordable than its larger version. Screen sizes are typically around 7 inches.



Figure 2: [Mini] Kindle Fire 1st Generation (Released November 2011)

- **Phablet** – This type of tablet gets its name from “smartphone” and “tablet” as a crossover between the smaller smartphone and the functional attributes of tablets. This type is also known as a hybrid. With screens in the 5-inch range, the typical phablet is around 5.5 inches. These tablets are designed for screen-intensive interaction with many having or including a stylus typically stored within the frame of the device for notetaking or sketching. These devices are typically used for mobile web browsing and multimedia viewing and like smartphones include a touchscreen interface. As the size of smartphones increases to even larger models than the phablet, what differentiates a phablet from a large smartphone is the 16:9 aspect ratio unique to the phablet. Some smartphones may be “longer” than the phablet and do not hold to the 16:9 aspect ratio.



Figure 3: [Phablet] Samsung Galaxy Note (Released October 2011)



- **Laplet (2-in-1)** – This type of tablet is uniquely identified as being equipped with a keyboard as part of its original design. This tablet typically includes on-screen keyboards that can also be used to interface with the device. These models run full-featured desktop operating systems like Windows® and Apple iOS® that allow them to run software (or apps) like those found on laptops/desktops. In addition, many models can be found to have I/O ports like USB or DisplayPorts (VGA, DVI, etc.). However, the laplet’s most prominent feature is the keyboard. Within this type of tablet, the laplet can be categorized as either a 2-in-1 Convertible or a 2-in-1 Detachable.
- **Convertibles** – This form of laplet has a keyboard that folds or flips back and is hidden or concealed by the screen frame when not in use
- **Detachables** – This form of laplet has a keyboard that can be detached from the actual laplet and stored separately. While other forms of tablets can include a keyboard as an accessory, the detachable laplet includes and integrated keyboard as part of its original design.



Figure 4: [Laplet] Convertible & Detachable Models

- **Others** – As the evolution of tablets continued to find unique consumer demands, other forms of tablets were developed. While less common now, there still exist other forms of tablets that target gamers. Gaming tablets may include peripheral devices that interface a much more functional gamepad or thumbstick to provide a better gaming experience for the user. Other designs included the booklet or clamshell designs that include an integrated gamepad or thumbstick. These are designed specifically for gaming experiences and are less functional when it comes to web browsing, multimedia viewing, apps or other diverse uses.



Figure 5: [Gaming] Nintendo Switch (Released March 2017)



Specification and Features of Tablets

When evaluating tablets, there is a wide range of general features that may be included in each's standard design or variations in brand models that provide consumers a wealth of options to meet their needs. Here are some feature categories that consumers can find as part of tablet specifications and marketing pieces packaged with the tablet.

- **Screen Size & Shape** – The standard tablet screen size is about 7 inches, however, variations including the phablet and mini tablets might be as small as 5.5 inches. The measure of a screen, like televisions, is determined by the diagonal length of the visible screen and does not include the actual size of the device or its frame or chassis. When held in landscape mode, most modern tablets have the short, wide shape of a wide-screen television (16:9 aspect ratio). It is important to note that not every model has the standard size screen. Screen sizes that are squarer in design may provide a smaller viewing screen when watching HD video that is formatted for the 16:9 aspect ratio.
- **Wireless Connectivity** – Most models offer WiFi connectivity as a standard feature. This allows the device to connect wirelessly to a local area network (router). The connectivity allows for downloading, livestreaming, and updating the operating system or applications. Although connecting to WiFi is most common, that does not work for all when connectivity is required but there is no available WiFi. Many models include cellular network connections. These models tend to be more costly and may add charges to your cellular network bill. However, it remains a valuable feature for those where WiFi is not enough. Keep in mind that some cellular plans allow the use to share smartphone internet service with their tablet.
- **Display** – The tablet display specifications are characterized in different ways.
 - One important factor in evaluating tablet displays is resolution. Higher resolutions make images and text appear sharper. Resolutions at the 800x600 level will present lower quality viewing than HD resolutions or even 3180x2160 UHD screens. However, UHD resolutions on a 7-inch screen may not be visibly better than lower resolution screens.
 - Some displays have an anti-glare coating that makes it easier for viewing in bright light. Shiny, uncoated screens can require higher screen brightness settings to view clearly which uses more battery power than lower screen brightness settings. Be aware that some anti-glare coating may require special cleaning products that the shiny glass uncoated screens require.
 - Viewing angles are another important display feature. Wider viewing angles allow the device to be held in different positions for viewing. This may also affect multiple viewers ability to see the screen clearly from different angles. This may be a benefit or not, depending on the circumstances. Users may not want the person in the seat next to them to be able to see their screen.
 - Tablets can include ambient light sensors that adjust display brightness and contrast automatically. This helps viewing ability and also can prolong battery life.
- **Operating System** – All tablets come with an operating system like those installed on laptops. They are scaled down versions that conserve battery life due to the smaller processors required to run apps. Google's Android®, Apple iOS®, Chrome OS®, and Windows® operating systems dominate the tablet market and is in large part the feature that effects the tablet's capabilities the most. The ability to update the operating system is critical to allowing the tablet to use the newest apps while improving the security of the device. There are other operating systems depending on the tablet. There is a direct correlation between operating system and available apps that a device can use.
- **Hardware** – All computing devices have a processor. The processors (measured in gigahertz) affect the speed at which processing occurs over the device. The larger the gigahertz (GHz) the faster and better performance. Performance and processing speed can also be affected by the amount of memory on the device, both hard drive and random-access-memory (RAM). As with the processor, the larger the better. Hard drive space can be as



little as 16GB and increase from there to as high as 64GB or 128GB. Of course, I/O ports can extend hard drive space. As it relates to RAM, tablets can range from 512MB to at or above 2GB.

- **Ports (I/O)** - Input and Output (I/O) ports can be an important feature in a tablet depending on its use by expanding its capabilities. The most common ports found include USB, Thunderbolt, and DisplayPorts. There are other ports available. A port can be used to expand a device's memory or connect an accessory as with gaming tablets. Some tablets include a slot for microSD cards which also serve to expand memory. There are a multitude of adapters and accessories that can be used with tablets to expand their capabilities using an existing port.
- **Printing** – a tablet's ability to print via WiFi adds a valuable function to the device. Those using Apple iOS® and Android® operating systems include the capacity for printing.
- **App Market** – One of the key features of most apps is that they are proprietary to the operating system. Depending on which OS is being used, the availability of apps is limited to those offered within that platform. Many developers create apps that are available on the largest platforms, Apple iOS® and Android®. Some apps come pre-installed on the tablet's operating system; all others must be downloaded. Hard drive space and operating systems can affect the availability and use of apps on any tablet.
- **Camera** – now standard in most portable devices, tablets can feature forward and rear facing cameras. The key to cameras is the quality of images. Two-camera devices may include cameras with different quality image capture. Also, the ability to record video/audio is a key function of many tablets. The higher the pixel value, the better the picture and video quality. For video, some models support and record in 720 HD or Full HD quality.
- **Battery Life** – Depending on the frequency and time a tablet is in active use, battery life can be a considerable factor. By design, tablets are smaller, lighter, and more efficient than laptops. Tablets can range from 7 to 10 hours of battery life. That time can vary even within the device's expected range. It all depends on active use, brightness of screen, use of WiFi and processing demand among a few variables.
- **Multiple Users** – The ability for a single device to be used by multiple users varies considerably. Some Android® models can allow the user to login with their own credentials. This is especially valuable for parents who want to limit and monitor apps used by children. Apple iOS® models do allow different users to login to their Apple account differently but not in the same way as the Android®.
- **Accessories** - As with most consumer products, there generally more accessories available than devices. They include Bluetooth I/O devices, covers, skins, stands, screen covers, and more. Some of them add to the functionality of your tablet, while others prolong their life. Some just make the device more fashionable. Regardless of the accessory, consider how the accessories add or detract from the value of your tablet.

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WIRELESS PORTABLE SPEAKERS

Anytime people get together, especially to celebrate an important occasion, music is invariably part of the celebration. Weddings, funerals, graduations, sporting events, prayer, romance, rocking a baby to sleep, or even studying can all have some music that plays a part of the activity. It is an important part of human life and culture. The portability of speakers and their wireless connection add convenience. Wireless and Bluetooth speakers bring top-quality sound whether you are at home, work, or on the go. The challenge can be in finding the right model for the occasion.

Wireless and Bluetooth speakers can range from as little as \$2 up to \$800 and are a convenient alternative to larger portable P/A systems. Their sizes can also range considerably along with other features available across all variations and models.

There are two main groups of wireless speakers available on the market today. While there are other technologies out there, the market share is split between Bluetooth® and WiFi. These two technological communication standards serve as the foundation of most wireless speakers and will be the focus of the information provided below.



Bluetooth

Bluetooth® is a short-range wireless communication technology that allows devices such as mobile phones, computers, and peripherals to transmit data or voice (sound) wirelessly over a short distance. The typical range for Bluetooth technology is about 30 feet.



WiFi™ is a wireless communication technology that uses radio waves to provide wireless high-speed internet and network connections that references IEEE 802.11x which is a standard for defining communication over a wireless local area network, or WLAN. The typical range for WiFi routers (2.4GHz) can reach up to 150 feet indoors and 300 feet outdoors.

Bluetooth and WiFi, like many other wireless devices in your home or office, use the same band of radio wave frequency clustered around 2.4GHz. If you see a sticker on your baby monitor, cordless phone, or wireless microphone on your karaoke machine it has nothing to do with speed. It simply refers to the radio band frequency being used to communicate or transmit data or sound. Although the effective range of Bluetooth and WiFi vary dramatically, both can be affected by interference from other wireless devices as well as structures like walls, furniture, and even people.



Figure 1: L-R, Bluetooth, WiFi, and Bluetooth/WiFi Capable Models (Source: Consumer Reports, 2019)

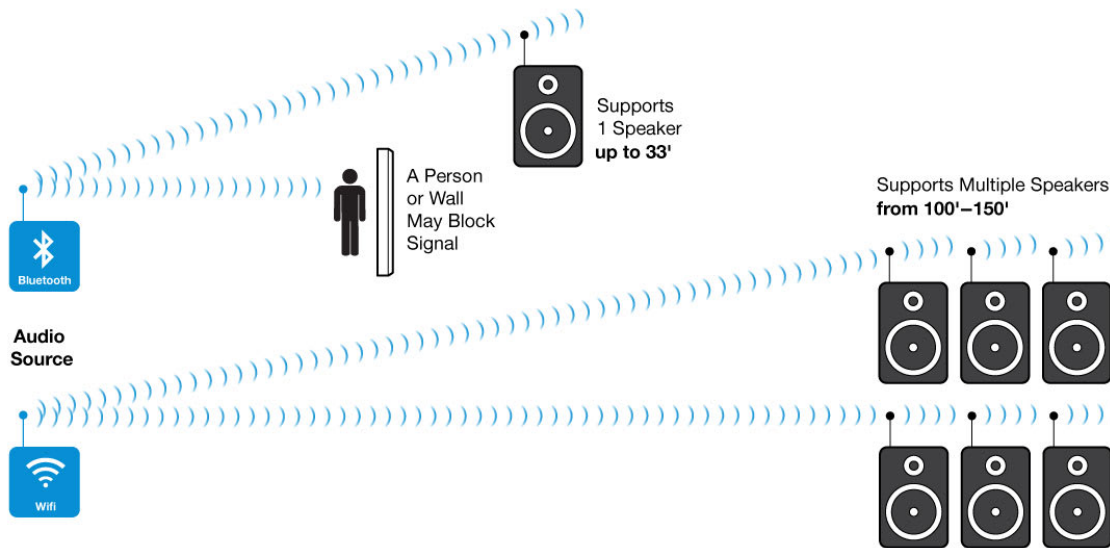


Figure 2: Bluetooth & WiFi Range (Source: Consumer Reports, 2019)

Some important features that you might find in this wide range of models developed for an even wider range of applications can be explored through these general descriptions.

Design

One of the most important design features of a portable speaker is that of size. Keep in mind that the smallest models (minis) and the largest models (sometimes called “tailgater” or “block rocker”) can both be considered portable wireless speakers.



Figure 3: [Mini] 0.7 oz & 1.5" x 1.5" x 1.0"



Figure 4: [Tailgater] 29 lbs & 12" x 15" x 20"

Without question, between these two examples, there would be a considerable weight difference. Depending on its use and application, weight can be a significant factor in determining the best model for the consumer. The smallest models could weigh only a few ounces, while the larger models could weigh up to or over 20 pounds.

In addition to weight, unit construction and design vary. The lightweight models are made of plastic materials or other lightweight composites. Large models may be made of more substantial materials. Choices of material provide function, durability, and style but don't let the looks fool you. Two different models of similar size and weight can both fit neatly in a backpack, however, one is going to the beach and other is going to study session. Construction of some models may include waterproof designs like those developed to go in the shower while others



may need to be more rugged than waterproof. Durability should extend not only to the model shell but include internal components as well. That includes interactive buttons, ports, and speakers. Some designs include rubberized or silicone edges as shock absorbing features in case they fall onto a hard surface. Finally, style can play a major role in deciding what type of speaker to purchase. Wireless speakers can provide a wide range of aesthetic designs from the sleek, modern, sophisticated looks to the more rugged outdoor design. The key to design, construction, size, style and durability falls on the intended use.

Portability

As referenced earlier, portability is a relative term and can include the Mini models, the Tailgate models, and everything in between. So, what are some important factors to consider in relation to these wireless speakers that make them portable? Of course, you can't put a 29-pound speaker in your backpack or beach bag. Nor can you experience any great level of success taking a WiFi speaker on a camping trip. Like design, the key is to determine how the speaker will be used and **where** it will be used. Moving a speaker around the kitchen can be portable as can carrying it in a canoe down the river.

Many "portable" speakers that connect via Bluetooth or WiFi must be plugged into a power source. Some have rechargeable batteries while other models require a battery pack accessory to power the speaker with a wired power source. Any of these configurations may be considered portable if they are moved easily from place to place for different needs and uses. Unless you are using disposable batteries, most devices must be plugged into a power source at some point. Don't discount a speaker that must be plugged in as not being portable.

Some facets that are covered in other parts of this resource include design, size, weight, battery life, charging, and even setup. Many of these also have relevance in a speaker's portability. You will need to evaluate some of those facets and their impact on portability given its intended use and purpose.

Sound

Sound quality can be a major factor in deciding which model is good for you. Like other features, where you plan to use it needs to be at the forefront of your decision. Large outdoor areas may require higher wattage or "bigger" sound than a small dorm room. However, loudness is not the only measure of quality. In fact, all wireless speakers require the transmission of data or sound to the speaker and the data compression has a dramatic impact on sound quality. In general, WiFi speakers are better than Bluetooth speakers due to how the data is compressed and transmitted. WiFi can transmit higher quality sound to the speaker than Bluetooth. Some of the simpler wireless models only have a single speaker and can only play in Mono as opposed to Stereo sound delivery. Higher end models may include 2.1 channel system that includes 2 channels of sound (left and right speaker) plus a separate subwoofer. The quality of sound between a Mono and 2.1 channel system is clearly distinguishable to any listener.

A wireless speaker's sound can also be affected by its arrangement of speakers. A single speaker can only send sound in a single general direction. There are other speakers that can send sound in multiple directions. Only a speaker with multiple speakers arranged appropriately can set in the middle of the room and send sound in all directions. These omnidirectional models will likely be more expensive than the single-speaker unidirectional speakers. Keep in mind that there are some shell designs that give the impression of multiple speakers or surround sound, so read the manufacturers information closely. The model in Figure 5 can be placed in the middle of a room and broadcast sound in all directions. The smaller model in Figure 6 plays sound in only 1 direction. If laid flat, the speaker will push sound upward. Speaker arrangement can add effective reach if that is the intent.



Figure 5: Omnidirectional Wireless Model



Figure 6: Unidirectional Wireless Model



Figure 7: Speakers arranged in a circular design

Wattage (W) is a feature that many speakers use within their marketing strategy. However, wattage is a power unit of measure. The true measure of speaker power is a combination of speaker rating (wattage), power of the amplifier, and efficiency between the two. Two models boasting 40W of sound may not necessarily be equally loud. Since you can't know the specs of the internal amplifier nor the speaker's efficiency, that would be like buying two jelly-filled donuts without knowing what filling was used. They just will not be the same. Also know that reference to wattage may not be specific to the speaker. You may see a 40W speaker, a 40W amp, or 40W of sound as a marketed feature.



Voice Control

These speakers are sometimes referred to as “smart” speakers and are voice command devices with an integrated virtual assistant that offers interactive actions and hands-free activation with the help of a wake phrase like “Alexa,...” or “Hey Google!...” or “Hey Cortana!...”

Some of these devices may be accessed via Bluetooth, WiFi, or both and may extend functionality of the speaker beyond playing sound (music) by accessing/controlling automated functions with integrated controllers.



Figure 8: Smart Speaker with Voice Control

Power Supply & Batteries

Portability of any device can certainly be extended by its ability to function under DC power. Wireless speakers may have integrated rechargeable batteries with a charging port, or they may require AC power supply to function. Some of the AC-powered devices can be powered by a battery-pack purchased separately as an accessory. AC-powered devices that can easily be unplugged, moved and plugged into another outlet can certainly be considered portable with the scope of its size and the availability of a power source.

For those that operate in some capacity with DC power (internal or external), their portability excluding size and function, is much greater than being tethered to a power supply with a power cord. Not all batteries are the same. There are differences in the amount of power they will store, how fast the device consumes the power, how long it takes to recharge, and what power source can be used to recharge to name a few. In addition, battery life can increase or decrease the life of your device especially if it is internal and cannot be removed/replaced.

Most DC models on the market have internal rechargeable batteries. Lithium-ion and Lithium polymer batteries provide great power density, are lightweight, small and safer than other designs in recent years. There are 3 factors related to understanding batteries: 1) Capacity – refers to the battery that will charge to 100% when new and only 70% over time; 2) Longevity – refers to the number of times a battery can be charged (charging cycles) before it will no longer charge; and 3) Performance – refers to the runtime of a battery on a full charge. However, most devices disclose two details, the battery type and either #-hours of runtime or “milliamp Hours” noted as **mAh**. The playtime/runtime is likely the closest comparable detail. Using mAh can be similar to the example above with speaker wattage.

Example: Consider two devices, one boasting 1,400 mAh and the other 4,400 mAh. The assumption that the 4,400 mAh battery will outplay the 1,400 mAh battery may be false if the 1,400 mAh device is considerably more efficient with its power than the other. They may have equal playtime.

Generally, Bluetooth devices will use less power than a WiFi device. Without knowing what quantity of mAh each has, their expected playtime is the closest comparable measure.

Setup

Establishing a connection between the broadcasting device (source of the data) and the wireless speaker is an important consideration. Bluetooth can be easily connected, whereas WiFi models require an app or more detailed



connection requirements. However, Bluetooth connections may be interrupted by device use (phone/alarm/notifications). WiFi devices, on the other hand, get their audio directly from the internet stream, avoiding interruption by the device.

Connection Range

Bluetooth can range from 30-33 feet but that can easily be affected (shortened/interrupted) by any large objects that may get between the connecting device and the speaker. This could include a wall, large structure, or even a person. WiFi ranges can extend from 100-150 feet. Obstructions are generally limited to walls and large structures. In an outside setting, WiFi could range up to 300 feet.

Pairing multiple devices

Some Bluetooth and WiFi models have the capability to pair multiple devices simultaneously. However, the pairing process, range, and other factors vary greatly between and among both types.

Pairing two devices via Bluetooth may be challenging in public areas with many devices. You need to know which one is yours (as it appears on your list of broadcasting devices) and it may be coded without the name making it difficult to recognize. Pairing Bluetooth can also pose issue if the signals are blocked or interrupted by moving objects (e.g. people at a party). WiFi devices may not be any easier to connect, but once connected they can be much more reliable if there is a WiFi signal. Also, pairing WiFi devices usually takes place using an app on a mobile device, tablet or computer.

Multiroom pairing is much more common among WiFi devices simply due to the signal strength, range and reliability of the WiFi signal. Pairing speakers in multiple rooms at home or at work may have many applications that add to the versatility of some wireless speakers.

Sources:

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Lifewire www.lifewire.com

Digital Trends www.digitaltrends.com



FITNESS TRACKERS

Fitness trackers continue to grow in popularity and simultaneously expand their capabilities in providing the user with a wider range of information and features about their health and fitness. Fitness can mean a lot of different things to a lot of different people. Fitness can be described as the condition of being physically fit and healthy at a level of being suitable to fulfill a particular role or task. The Center for Disease Control defines physical fitness as the ability to carry out daily tasks with vigor and alertness, without undue fatigue, and with ample energy to enjoy leisure-time pursuits and respond to emergencies. It includes everything from getting out of bed to hiking to performing CPR. Trackers have been designed and developed to monitor some vital data of human activity, convey that data in a meaningful and useful way, and provide the user with valuable feedback to evaluate their progress toward reaching their own fitness goals.

Everyone’s physical condition and fitness goals are as unique as their fingerprints. The challenge for developers of these valuable biometric devices is to provide products that address the needs of these uniquely different consumers. Before purchasing a fitness tracker, consider asking the following questions:

- What are your physical fitness goals?
- Are you trying to boost a lapsed fitness routine?
- Are you training for a marathon or road race?
- Are you trying to adjust activities related to improving a clinical condition?
- Are you trying to monitor vitals for evaluation and benchmarking?

The term “tracker” implies that it is monitoring or following your physical activity. While some believe that a tracker might improve your physical fitness, the reality is that it does not affect anyone’s physical activity directly but only indirectly by the information it provides the user. However, that information can be extremely useful and helpful to the user by monitoring progress to their own specific goals. They can also provide motivational support in the form of challenges, interaction with online friends, and alerts when “it is time to get up.” However, like a gym membership, it only provides that information if you use it.



Figure 6: Fitness Trackers (Source - Geek.com)

A Fitness Tracker is generally a wrist-worn device that can detect some combination of walking steps, heart rate, sleep patterns, and even swimming laps. Most interact with computers to download the wearer’s activity using Bluetooth® technology.

While many smartwatches on the market do monitor a few physical activities via some type of health/fitness app, dedicated fitness trackers tend to monitor more functions more accurately.

Sensors integrated into all fitness trackers monitor your activities and movements and transmitting that data wirelessly to an app or computer. The value in this process is that it stores data over time allowing the wearer to



keep historical records that may provide insight towards progress, identify trends, and track progress longitudinally. Of course, each tracker's ability to monitor activities varies. Trackers can measure steps, sleep patterns, heart rate, skin temperature, and some even measure the amount of moisture on the skin (perspiration).

Key features that help these wrist-worn devices function:

- Accelerometer – tracks up-down, side-to-side and front-to-back movements helpful in measuring steps and other physical movement
- Heart rate sensor – monitors the user's pulse rate during any physical activity through the day, including while at-rest
- Gyroscope – a sensor that detects if the user is standing, sitting, reclining, swimming, biking, etc.
- GPS – used to track physical location and movement
- Magnetometer – measures magnetism detecting direction of movement
- Barometer – measures air pressure to detect slight changes in altitude, like flights of steps

Not every fitness tracker includes all these sensors and forms of collecting and transmitting data about the wearer. Finding the right fitness tracker is a very thoughtful process that requires the consumer to consider their own goals, needs, and the tracker that can connect them all. Some trackers can sync with other devices that provide more accurate measures like a bathroom scale. Like smartwatches, they can even provide notifications of incoming calls, emails, or text messages.

Keep in mind that there are more and more devices being developed to identify, monitor, and detect medical conditions. These are not fitness trackers by design and are considered a different class of monitors. These are wearable medical devices such as the KardiaBand® that is worn by patients with irregular heartbeat. These are medical tools not fitness trackers.

Consumer Reports identifies two types of fitness trackers, the All-Day and the Training models. A third model has surfaced lately adding a new dimension to this growing market, the Ring tracker. All of these are similar in function while the latter two are wrist-worn, the new finger-worn models are included in this category of products.



Figure 7: All-Day Fitness Tracker



Figure 8: Training Fitness Tracker



Figure 9: Ring Fitness Tracker



All-Day Fitness Trackers

These models are designed to be comfortable, fashionable and discreet with the many functional features of most fitness trackers. These trackers can include any or all the following functional benefits to the wearer.

- Steps taken
- Stairs climbed
- Duration of activity/exercise
- Active minutes (resting vs. moving)
- Sleep time (may include REM sleep)

Training Fitness Trackers

These models tend to be more rugged in design. They are also designed to fit different types of intense physical activity which may include the need for them to be water resistant, waterproof or fully submersible. They may include any or all the following for the wearer.

- Generally, all functions of All-Day trackers, plus
- Heartrate monitoring
- Breathing patterns
- Miles traveled (walking, jogging, or running)
- Speed, pace, and route
- Swimming laps in the pool
- Altitude changes (cyclists, skiers, and hikers)
- Music controls

Ring Fitness Trackers (Smartring)

These models are relatively new to the market and is a different wearable than the wrist-worn models but still included in this category of products. The are considered by some critics to be more like jewelry with technology build in them, rather than technology build around its wearable design. By nature of its size, this device is paired with a smartphone app and does not include any visible display like most other fitness trackers. By nature of their size, they can use Bluetooth® or NFC technology. There are very few products on the market but the functional benefits among them consistently include:

- Sleep tracker
- Activity
- Heartrate

Selecting your Fitness Tracker

With the three types of fitness trackers identified above, and their relative monitoring features highlighted, their remain some important consideration when looking to purchase a fitness tracker. Taking functional characteristics into consideration, the consumer should evaluation the following features.

- **Style** – Trackers come in all shapes and sizes. The best approach is to try them on before you purchase one that fits well and matches your form and function as well as personal style. They are available in a wide range of colors and materials with most include silicone, rubber, or nylon bands. In addition, some come with interchangeable bands or other accessories to add to their stylish appeal. The closures also may be an important thing to consider. They key with style is to find one that you feel comfortable wearing every day. Like any good stylist, accessories make these devices a bit more attractive for the style-conscious wearer to include bands, skins, guards, etc.
- **Display** – Some trackers have no onboard display at all, including the ring fitness tracker. The only way to view the data monitored and collected is through a smartphone or computer app. Others will include all relevant measured functions on a digital display to include progress charts/graphs and real-time information. This is can be important in a workout setting when you are trying to reach a target heartrate or other form of real-time feedback. Others, however, may fall somewhere in between showing only symbols, words/numbers, or even provide audible feedback



and notifications. The app associated with each device should also be considered as part of the “display” features. That is an interactive component between the user and the data on the device. If you plan to spend considerable time outside, consider the readability of the display in bright lights for daytime activity and conversely low-light activity.

- **Compatibility** – As most devices link to a smartphone or computer app, determining which one interfaces with your existing devices is critical. Some trackers only sync with Apple iOS® devices, while others interface with Android®. One important thing to remember is that most do not work with Windows®.
- **Accuracy** – There is a wide range of sensors and technology in these trackers. Not all are created equal. As a result, there is some degree of imprecision that is inherently part of these devices. This is more so true of multifunction devices. Devices that focus on a single measure are more likely to be accurate than multifunction models. For example, if you are primarily interested in heart rate during your workouts, you may want to look for the devices that have a sensor strapped to the chest that transmits to the wrist-worn tracker.
- **Battery Life** – The tracker’s ability to monitor your fitness activity is limited by its battery life. Trackers can have battery life lasting as short as 1 day to several months depending on the type of battery, type of device, and its functional features. Some devices use the disk-type “watch” batteries which are disposable. Battery life can also be affected by the functional features on the device. Touchscreen displays with sound, vibration, multiple sensors, etc. can use considerably more battery life as well. However, the complexity of battery type, size of the tracker, and functions makes it difficult to evaluate. Read product labeling to “battery life” details. Most will disclose the length (in days) that the tracker can be worn on a full charge. Compare that with your own personal preferences to determine if removing the device daily is better suited to your routine or a device that runs for longer periods of time is more favorable. This becomes a very personal decision. Don’t overlook reviewing its charging technology. Knowing how the device is charged may influence your choice (e.g. docking station, USB charger, A/C adapter)
- **Water** – Water and electronics rarely play well together when it is spontaneous. Plan ahead and look at the tracker’s design as it relates to water. Your workout may not include a few laps in the pool, but a physically challenging workout may produce a river of sweat that might affect your tracker. Some trackers are in fact waterproof to allow for the swimmer to keep it on. Others may only be “water-resistant” and can survive handwashing and the occasional splash.

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OUTDOOR EQUIPMENT

Tents, Sleeping Bags, and Camp Stoves

In 2011, an estimated 42 million Americans went camping. Those campers spent a staggering 534.9 million days camping! There are many different types of camping experiences, each varying in time, terrain, season, and purpose. Properly preparing for a camping trip is probably one of the most important aspects of making the experience enjoyable. With this many people and time spent in the outdoors, it is important for each person to equip themselves with the best and most appropriate equipment available.

Three essential camping equipment items presented in this study guide are tents, sleeping bags, and camp stoves. With advances in technology over the last century, each item has improved in construction and purpose and is no longer a “one size fits all” product. To ensure a fun camping experience, consumers should become familiar with the many differences in the equipment before making purchases.

TENTS

A tent is a portable shelter constructed of a fabric and supported by poles, with lines securing the structure to the ground. Today’s tents are built in/for a variety of shapes, seasons, sizes, weights, features, and purposes.

Seasons

- Three-Season Tents are designed for spring, summer, and fall. These have a variety of ventilation options and are typically made of thinner, less durable material than four-season. It is best used in mild to hot climates.
- Four-Season Tents are built to provide better protection from snowfall and wind. Venting is minimal and the material is tougher than three-season. The season type is a bit misleading in that these tents are really designed for one season, winter. This type of tent may not be suitable for hot climates due to its limited ventilation.

Size and Weight

One of the biggest factors in selecting a tent is its size. Size is usually quantified by how many people can sleep on the floor. This is typically depicted by a “person” rating. As an example, a tent may be described as capable of sleeping 4 people. Keep in mind, this rating does not take into consideration any gear that may also need to be stored in the tent. An alternative means of determining the best tent size is to estimate the amount of floor space needed by the camper(s) and match that to the floor space (noted by dimensions or square footage on the packaging) of the tent being purchased.

With size also comes weight. Factors that affect weight are the size of the tent itself, the type and amount of material used, and the tent’s features. Weight is an extremely important factor to consider when camping in more remote locations (i.e., backpacking or wilderness camping) and the camper is hauling the gear on foot to the campsite. Weight is less of a factor if the camper is “car camping” (parked close to the campsite) or using a horse or ATV to haul the gear.

Features

Today’s tents come with a variety of available features that help make your living space more enjoyable and comfortable.

- **Rain fly:** a removable, water-resistant outer wall made of cloth that helps protect the tent from rain. Rain fly’s come in two categories: full-length and partial. Full-length extends almost completely to the floor and provides the most protection. Partial covers the mesh panels at the top of the tent and offers more ventilation than the full-length.
- **Vestibule:** a floorless “porch” usually created by an extension of the rain fly. Its purpose is to provide a semi-protected transition area between the tent and the outdoors. It is often used as an area to remove wet or muddy shoes.
- **Door:** a cloth door panel that is often secured by a zipper. Some tents have multiple doors to allow easier movement in and out of the tent.
- **Poles:** a rod made of aluminum, fiberglass, or carbon fiber that helps provide shape and structure to a tent. Fiberglass poles are found on inexpensive, light-duty tents (cheaper, heavier, and less durable than the other two). Aluminum poles are strong, light, and inexpensive. Carbon fiber poles are found on high-end tents. These are very light and strong, but are the most expensive to replace.
- **Panels/Walls:** the inner cloth canopy that is made up of a solid and/or screened (mesh) material. A solid, waterproof wall can provide protection from rain, but provides less ventilation inside the tent. A screened wall



allows for better airflow in and out of the tent, but does not prevent rain from entering the tent. A hybrid design that uses a mixture of solid and screened material helps reduce condensation inside the tent.

Tent fabrics usually have a waterproof rating associated with its polyurethane-coated fabric. Higher values are associated with better waterproofing capabilities. For example, a rain fly with a rating of 2,500mm is more waterproof than 1,000mm. Keep in mind, the higher the rating (more coating), the heavier the tent will be also.

- Windows: typically made of screened (mesh) material; it allows air to flow in and out of the tent while also minimizing entry of insects or other critters
- Floor: a fabric component of the tent that is made of more durable material than the walls. The floor must hold up against the weight of its occupants and contact with the ground.
- Footprint: a durable material (also called a ground cloth) that is placed under the tent to provide extra protection from abrasion and moisture. A footprint will also help extend the life of the tent.

SLEEPING BAGS

Camping is all about enjoying the great outdoors, but while you’re fast asleep in your tent, comfort is probably the number one priority. Having the right sleeping bag can make all the difference in getting a restful sleep. Below are three of the most important factors to consider when purchasing a sleeping bag.

Temperature Rating

The temperature rating indicates the lowest ambient temperature that the average user would still remain comfortable at inside the sleeping bag. For example, a rating of +35°F means that the average person would remain comfortable inside the sleeping bag at 35°F or higher. In selecting the ideal bag, select one that is rated for the coldest temperature expected.

Insulation Type

Most sleeping bags are insulated with either a synthetic polyester fill or goose down.

Type	Advantages	Disadvantages
Synthetic	Insulation when wet Dry fairly fast Easy to clean Less expensive Non-allergenic	Heavier Bulkier Shorter age Doesn’t conform to body as well
Down	Warmer ounce for ounce Lightweight Highly Compressible Longer age Wicks moisture	Useless when wet Slow to dry Requires special cleaning May contain allergens More expensive

Source: <http://wildbackpacker.com/gear/sleeping/buyingguide.html>

Shape and Size

The most common shapes (in order of largest capacity to smallest) are rectangle, semi-rectangular, and mummy. Of the three, mummy shapes are smaller and typically lighter weight, ideal for backpacking. To compare sizes when purchasing, check the shoulder and hip girth specifications. Lengths come in “regular” or “long”. Long is recommended for individuals 6’ 6” or taller.



CAMP STOVES

Size and weight

Camp stoves come in a variety of arrangements, fuel types, and accessories. Stoves can range in weight from a few ounces to several pounds. Select a stove that minimizes weight and volume when backpacking. Be sure to factor in the weight of the stove's fuel. If car-camping, size and weight are less of a factor.

Burners

Stoves are designed with single or multiple burners. Single-burners are best for simple meal preparations such as boiling water, or a single can/pot of food. Multiple burners are ideal when preparing large meals that require more than one burner going at a time. Single-burners weigh less, and are the burner of choice for most backpackers.

Fuel Type – Cartridge vs. Liquid Fuel

- Cartridge Stoves use compressed gasses such as propane, butane, or iso-butane that come in their own container. These are typically lighter in weight, require less maintenance, and burn cleaner. Butane does not perform at temperatures below freezing (32°F). Stoves are sold as a burner that attaches to the top of the cartridge, and the cartridge serves as the stove's base. Canisters cannot be refilled.
- Liquid Gas Stoves have a refillable fuel tank that is typically filled with white gas or kerosene. These stoves work better in cold and windy conditions than cartridge stoves; however, they are more difficult to use and require more maintenance. Liquid fuels are heavier than the compressed gas fuels.

RESOURCES:

- <http://www.outdoorfoundation.org/pdf/research.camping.2012.pdf>
- <http://www.dickssportinggoods.com/info/index.jsp?categoryId=13083851&infoPath=222977>
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OUTDOOR BACKPACKS

The following is a general guide for which pack sizes (measured in liters) typically work well for backpackers during warm-weather hikes of varying lengths. Colder-weather trips usually require a larger pack, while ultralight backpackers may choose to go smaller than the recommendations here. (For more information, see our Expert Advice article on Ultralight Backpacking.)

Length of trip	Pack capacity (liters)
Weekend (1–3 nights)	35–50
Multiday (3–5 nights)	50–80
Extended (5+ nights)	70+

Weekend (1–3 nights; 35–50 liters)



Efficient packers using newer, less-bulky gear can really keep things light on 1- to 3-night trips by using a pack in this range. Be aware that packing light requires self-discipline and careful planning. If you can pull it off, though, the light-on-your-feet rewards are fantastic.

Multiday (3–5 nights; 50–80 liters)



These are the most popular backpacking packs sold at REI, and they’re an excellent choice for warm-weather trips lasting 3 or more days. 50–80 liter packs are also used for backcountry skiing, for day trips, overnights and sometimes 2-night trips.

Extended-trip (5+ nights; 70 liters or larger)



Extended trips of 5 days or more usually call for packs of 70 liters or larger. These are also usually the preferred choice for:

- Winter treks lasting more than 1 night. Larger packs can more comfortably accommodate extra clothing, a warmer sleeping bag and a 4-season tent (which typically includes extra poles).
- Adults taking young children backpacking. Mom and Dad wind up carrying a lot of kids’ gear to make the experience enjoyable for their young ones.

Climbing Packs



REI also carries packs designed primarily as climbing packs. Most have modest capacities that are appropriate only for day trips or overnights. Common features include:

- The ability to strip down the pack to its minimal weight (removing the lid, framesheet and possibly the hipbelt) for use during a summit push.
- A narrower, sleeker, sometimes higher profile than a usual packbag, permitting unencumbered arm movement.
- Several lash-on points for external tool attachment.
- A daisy chain—a length of webbing stitched to the outside of a pack—to provide multiple gear loops for attaching a helmet or tools.
- A reinforced crampon patch (to prevent crampon points from gouging holes in the packbag).
- Gear loops on the hipbelt or low on the pack body, useful as clip-on points for gear or possibly as attachment points for skis.
- Shop REI’s selection of backpacks.

Backpack Fit

Once you’ve chosen the type of backpack you want, the next step is to work with an REI sales specialist to expertly fit you to your pack.

The right fit is one that offers:

- A size appropriate for your torso length (not your overall height).



- A comfortably snug grip on your hips.

If you're unable to work with a fit specialist in a store, you can enlist a friend and follow the directions provided in the REI Expert Advice article on Finding Your Torso and Hip Size.

Torso Length

Some packs are available in multiple sizes, from extra small to large, which fit a range of torso lengths. These ranges vary by manufacturer and by gender. Check the product specs tab for size details of a specific pack.

Other packs may feature an adjustable suspension, which can be modified to fit your torso, especially if you're in between sizes. The drawback: An adjustable harness adds a little weight to a pack.

Waist Size

The majority of a backpack's weight, 80% or more, should be supported by your hips.

Backpack hipbelts usually accommodate a wide range of hip sizes, from the mid-20 inches to the mid-40 inches.

People with narrow waists sometimes find they cannot make a standard hipbelt tight enough and need a smaller size. Some packs offer interchangeable hipbelts, making it possible to swap out one size for another.

Women-Specific Backpacks

These are engineered specifically to conform to the female frame. Torso dimensions are generally shorter and narrower than men's packs. And hipbelts and shoulder straps are contoured with the female form in mind.

Youth-Specific Backpacks

These typically offer smaller capacities and include an adjustable suspension to accommodate a child's growth. Women's backpacks, with their smaller frame sizes, often work well for young backpackers of either gender. So do small versions of some men's packs.

Additional Backpack Fit Adjustments

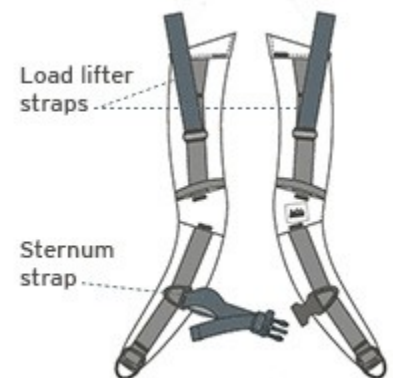
Load lifter straps

Are stitched into the top of the shoulder straps, and they connect to the top of the pack frame. Ideally, they will form a 45° angle between your shoulder straps and the pack. Kept snug (but not too tight), they prevent the upper portion of a pack from pulling away from your body, which would cause the pack to sag on your lumbar region.

Sternum strap

This mid-chest strap allows you to connect your shoulder straps, which can boost your stability. It can be useful to do so when traveling on uneven cross-country terrain where an awkward move could cause your pack to shift abruptly and throw you off-balance.

For tips on pack loading, see the REI Expert Advice article on How to Load a Backpack.





Backpack Frame Type

Internal-frame backpacks

The majority of packs sold at REI today are body-hugging internal frame packs that are designed to keep a hiker stable on uneven, off-trail terrain. They may incorporate a variety of load-support technologies that all function to transfer the load to the hips.

External-frame backpacks

An external-frame pack may be an appropriate choice if you're carrying a heavy, irregular load. Toting an inflatable kayak to the lake or heading out to the backcountry with surveying tools? An external frame pack will serve you best. External frame packs also offer good ventilation and lots of gear organization options.

Frameless backpacks

Ultralight devotees who like to hike fast and light might choose a frameless pack or a climbing pack where the frame is removable for weight savings.

Backpack Features

Main compartment access:

- Top-loading openings are pretty standard. Items not needed until the end of the day go deep inside.
- Some packs also offer a zippered front panel that folds open exposing the full interior of the pack, or a side zipper, which also makes it easier to reach items deeper in your pack.

Sleeping bag compartment

- This is a zippered stash spot near the bottom of a pack. It's a useful feature if you don't want to use a stuff sack for your sleeping bag. Alternately, this space can hold other gear that you'd like to reach easily.
- Top lid: Many packs offer a zippered top lid where most backpackers store quick-access items: sunscreen, insect repellent, camera, snacks, map. Some lids detach from the main pack and convert into a hipbelt pack for day trips.

Pockets

Typical offerings:

- Elasticized side pockets: They lie flat when empty, but stretch out to hold a water bottle, tent poles or other loose objects.
- Hipbelt pockets: These accommodate small items you want to reach quickly—a smartphone, snacks, packets of energy gel, etc.
- Shovel pockets: These are basically flaps stitched onto the front of a packbag with a buckle closure at the top. Originally intended to hold a snow shovel, they now pop up on many 3-season packs, serving as stash spots for a map, jacket or other loose, lightweight items.
- Front pocket(s): Sometimes added to the exterior of a shovel pocket, these can hold smaller, less bulky items.

Ventilation

This can be a drawback of internal-frame designs. Much of the pack rides on your back, cutting airflow and accelerating sweaty-back syndrome. Designers have addressed this in a variety of ways—ventilation “chimneys” built into back panels, for example.

A few packs have engineered a suspended mesh back panel, sometimes called “tension-mesh suspension.” This is a trampoline-like design where the frame-supported packbag rides along a few inches away from your back, which instead rests against the highly breathable mesh.

Padding

If you're using a lightweight pack with a fairly minimalistic hipbelt and lumbar pad, you can encounter sore spots on your



hips and lower back. If this is the case for you, consider using a cushier hipbelt.

Attachment points

If you frequently travel with an ice axe or trekking poles, look for tool loops that allow you to attach them to the exterior of the pack. Rare is the pack that does not offer at least a pair of tool loops.

Backpack Accessories

Raincover

Pack fabric interiors are usually treated with a waterproof coating. Yet packs have seams and zippers where water can seep through, and the fabric's exterior absorbs some water weight during a downpour.

The solution is a raincover, which could be a plastic garbage bag (cheap but clumsy) to a more customized packcover. If you expect rain on your trip, this is a good item to carry. An alternative: bundling gear internally in waterproof "dry" stuff sacks. Lightweight dry sacks can be a better option in windy conditions; strong gusts have the potential to abruptly peel a cover right off a pack.

Hydration reservoir

Nearly all packs offer an internal sleeve into which you can slip a hydration reservoir (almost always sold separately) plus 1 or 2 "hose portals" through which you can slip the sip tube.

REFERENCE

REI, <http://www.rei.com/learn/expert-advice/backpack.html>