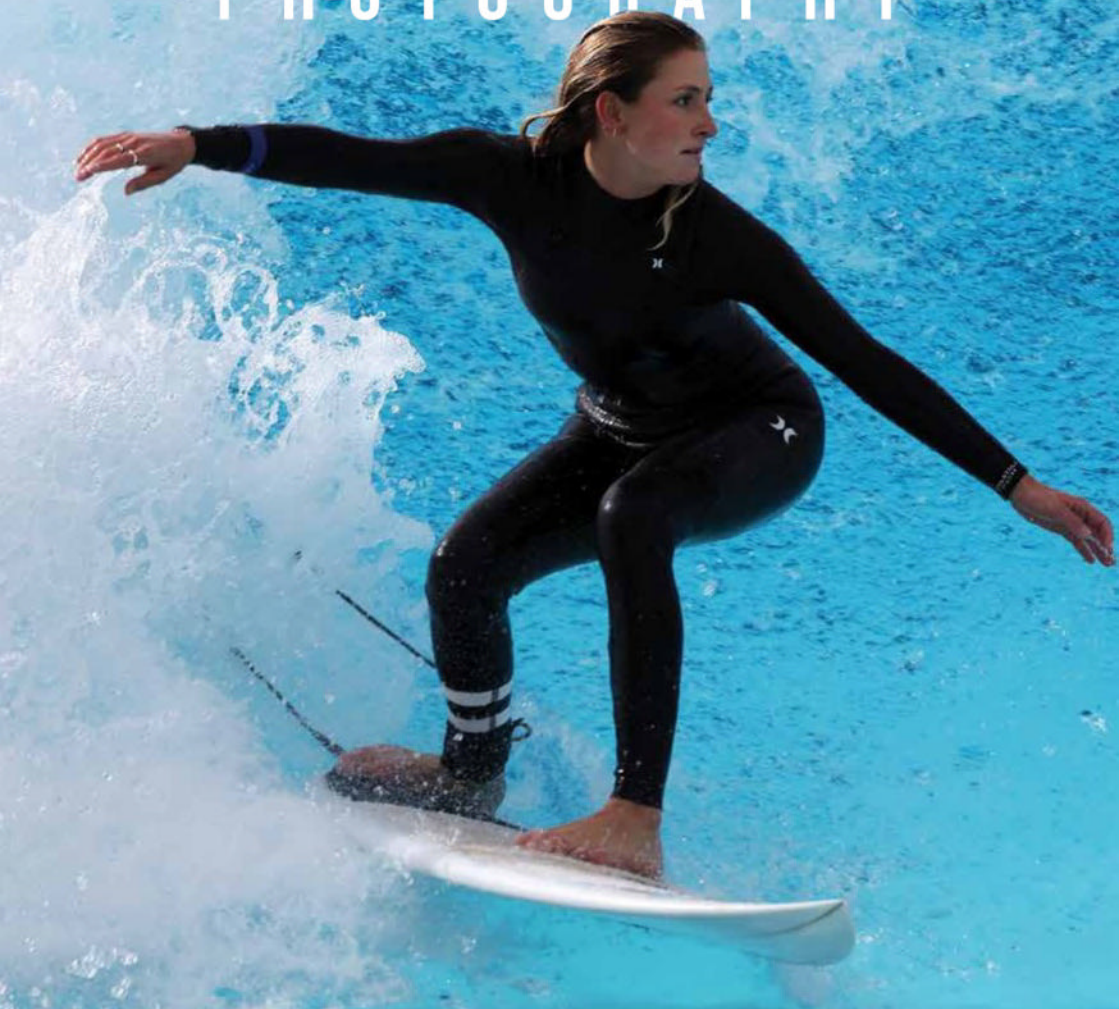


SPORTS

PHOTOGRAPHY



Sports Photography

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ISBN: 978-1-922156-68-6

**Order print and ebook editions online at
www.photoreview.com.au/guides**

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Media Publishing Pty Limited

ABN 86 099 172 577

PO Box 4097

Balgowlah Heights NSW 2093 Australia

Email: edmail@mediapublishing.com.au

Cover image by Margaret Brown

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CHAPTER 1

PHOTOGRAPHING SPORTS

Our love of sports often starts when we're toddlers wearing the family footy team colours and grows as we begin to throw and kick balls. Many people join clubs when they're school age and remain involved well into adulthood, going on to enjoy watching matches when they're too old to actually play.

Sports play such an important role in our lives that we want to preserve our memories of them. That usually



Many people remain involved in sport well into their senior years.

involves taking photos – and increasingly recording events and activities in video.

Whether you shoot still photos or video, taking photos of your children, friends or colleagues as they participate in sporting events is more fun than simply watching from the sidelines. You join in the general excitement and become much more deeply involved in the action. You can share in the participants' success – or commiserate with them if they're not winners.

Unfortunately, your smartphone isn't much good for photographing sports. It might work well for everyday photos and travel shots, but smartphones fall well short when it comes to capturing action, for the following reasons:

1. The screens on smartphones are often hard to see clearly in bright outdoor lighting – particularly if you're wearing polarising sunglasses. This makes it hard to frame shots and you can be distracted by things going on in your immediate vicinity.

2. Although the latest smartphones use very sophisticated image processing, very few phones provide the degree of control over the camera settings you need to take good sports photos.



Participation in sport starts early and continues throughout our lives and, as a result, it's well worth recording and preserving these memories.



Shots like this one, which capture the community excitement at the end of a game, are always worth including in your portfolio.





It's unrealistic to expect to get good action photos from professional sporting arenas where most of the time you can't get close enough to the action without a long telephoto lens, and long lenses are often not permitted for spectators at pro sports events.

3. While most phones have several cameras, they are usually prioritised towards wide-angle capture. 'Telephoto' cameras are seldom long enough to bring the action close and, where they're provided, may achieve their effects by cropping the image frame (which results in a loss of image quality).

If you want to take great sports photos and videos, you'll need a 'proper' interchangeable-lens camera. Check out the options to choose for different types of sporting action in the next chapter.

Getting started

The following general tips will help you to make the most of the opportunities you have once you're at the sports venue.

1. Learn as much as you can about the sports or activity you want to photograph. When you understand the rules of the game you know what to expect and can make plans for taking the shots you want.

There are plenty of online resources that teach the rules of the sport and highlight the key parts of the game. Online resources are also available for particular sports to advise you on what equipment to use and the types of images to aim for and can help you plan the best shooting positions.

2. Check out the venue – particularly at the times when events occur. Visiting the place beforehand allows you to see which areas are likely to be reserved for the participants and which for the onlookers.

You'll also learn where the light sources are and whether there are wind corridors to pay attention to. This lets you make initial plans about the best places to stand.

Some sports are better shot from specific positions. For example, if you shoot a running race, the best shots are often obtained when the competitors are photographed head-on – or at a shallow angle from a position on a curve in the course.

Initially, at least, it's best to avoid shooting directly into the sun so, if you want to focus on a particular individual (or group), try to select a position that puts that subject facing you.

3. Check where the event's organisers are positioned. Referees are normally out on the game field; judges will have an overview of the action and spectators are usually kept to the periphery of the game.

Always respect the officials, coaches, athletes and other organisers of the event. Don't try to push your way into areas where you're not welcome; obnoxious photographers can spoil opportunities for everyone watching the event.

4. Pay attention to what is going on around you once you're in position and able to shoot. Constantly checking your pictures ('chimping') or looking at your phone means you may miss out on the best shooting opportunities. You could also be hit by a ball or have somebody bump into you while you're distracted. Leave all that until the event is over.



These two images show the differences in reach between a smartphone's telephoto mode and a 135mm telephoto zoom lens on an interchangeable-lens camera.



You'll need a long telephoto lens to get close-up of action in sports like cricket, where you can't get close to play. This shot was taken with a 600mm lens on a full-frame DSLR camera.

Special conditions

Sports vary widely in the activities, action, and venues in which they take place. However, some general situations prevail, particularly with respect to how close you can get to the action you want to capture.

Getting close can be easier when the sport you're photographing is a team sport that is confined to a particular venue. It can also be straightforward when photographing an individual activity, such as a race or competition (think archery or gymnastics) in an arena.

You must also consider the time of day when the event is held. Day and night and conditions will vary with the time of day and whether you're shooting under natural or artificial lighting.

Most modern cameras can handle both types of lighting – and even mixed daylight and artificial light – very competently. However, they usually have difficulty recording a full range of tones under harsh midday light and the autofocus system can struggle in poorly-lit situations, especially if you're shooting with a telephoto zoom lens.





Sports like sailing can only be photographed from a distance with a long lens, although some courses will force competitive boats close to the shore (or in this case a ferry wharf), which gives you a chance to take a close-up. Even then, you'll need a telephoto lens; in this case with a 400mm focal length.



With appropriate equipment and prior planning you can obtain good action shots during outback events like the Finke Desert Race. © Nick Brown.

Horse racing and motor sports tend to keep a distance between spectators and participants. For the latter, spectators can often only get within shooting distance of the track when they're behind a protective mesh barrier (which will impose additional restrictions).

Sports like sailing, surfing and similar water-related activities require you to shoot from greater distances with a long lens. Alternatively, you may be able to go out on the water, either in a boat or with a waterproof camera, to photograph individual participants. Otherwise, you'll need to find a place where the action comes close to shore.

Inland races involve completely different conditions and, usually, few barriers for spectators. As well as regular horse and camel races, these events include marathon foot races and events like the celebrated two-day Finke Desert Race for motorbikes, cars and buggies.

That race uses off-road tracks between Alice Springs and the small Aputula (Finke) community. Despite their isolated locations, races like this are usually closely monitored with requirements for spectators posted well in advance on the race's website and carefully policed along the way to ensure maximum compliance.

Sports presets

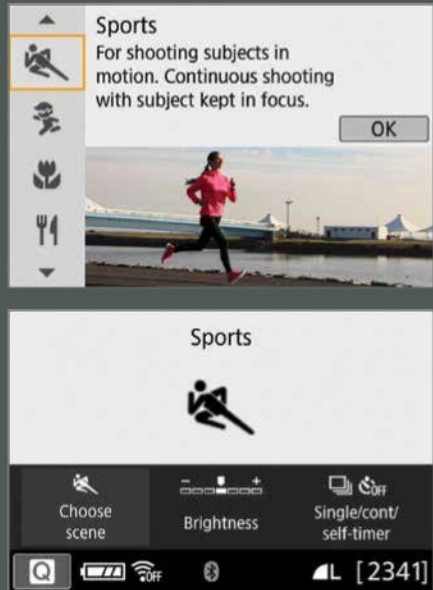
Many consumer-level cameras include 'Scene' pre-sets to help novice users choose a camera setting that can deliver acceptable results by detecting particular subject types and configuring the camera accordingly. Once a particular pre-set is selected, all the photographer needs to do is point the camera and press the shutter button.

Normally, you can only set image size and quality, leaving other shooting parameters non-adjustable. The pre-sets are only applied to JPEG files and most cameras don't support raw file capture when the Scene mode is selected.

'Sports' and 'Action' pre-sets are among the most common options available, along with Portrait and Landscape settings. The Sports mode prioritises 'freezing' action so the camera defaults to a fast shutter speed, usually higher than 1/200 second, depending on ambient light levels. Many cameras start with 1/500 or even 1/1000 second.

Unless the ambient light levels are high (such as when you're shooting on a bright, sunny day), the lens aperture is set to the maximum available. This can be useful when you want to isolate subjects from an out-of-focus background – but it could mean only subjects close to the camera are sharply focused.

Most cameras default to an auto ISO setting, which could encompass the camera's entire ISO range. There's a risk image quality will suffer due to noise at the



highest ISO settings so, if your camera lets you customise the range settings, set the upper limit at a value you know won't be noise affected (ISO 1600 or ISO 3200 should be safe for most cameras, regardless of their sensor size).

Focusing usually shifts to the continuous AF mode, with most cameras including focus tracking. Face recognition can improve focusing accuracy when photographing moving people – so take advantage of it.

As well as its designated use for sports, this mode can be used for photographing active children and/or pets, birds in flight and recording stage performances. It can help inexperienced photographers achieve more usable shots with long zoom lenses.

CHAPTER 2

CHOOSE THE RIGHT EQUIPMENT

Different sports have different requirements – and each photographer will have their own ambitions as to the kinds of shots they want to take. How do you know your current camera will be good enough?

There are a few universal requirements that must be met:

1. The lens must be able to fill the frame with the subject. Sports shooting usually requires a telephoto lens. We cover lens

choices later in the chapter.

2. The camera must be able to focus on the subject quickly and precisely – and, if possible, keep the subject in focus while it is moving. That's a big ask for an older camera, but widely supported in cameras released during the past couple of years. You can learn the finer points of autofocus and subject tracking in Chapter 5.



You can easily photograph equestrian events at gatherings like local shows with either an entry-level interchangeable-lens camera plus a 200mm lens or a super-zoom compact camera.



Action shots like this require a camera with fast and precise autofocus plus a lens that is long enough to fill the frame with the subject and a camera that can record the wide brightness ranges common in snow sports. © Alex Moysan.



This shot, taken with a small-sensor compact camera using the 5x optical zoom lens at full extension illustrates one of the limitations of compact cameras. While the lens was able to focus on the subject nearest the camera, the automatic exposure system selected f/5.6 and ISO 800 with a shutter speed at 1/40 second, which was too slow to ‘freeze’ that player’s action effectively. The depth-of-field at f/5.6 was also too shallow to provide clear images of the other players.

3. You must be able to take control of exposure parameters like the shutter speed ISO sensitivity and lens aperture. These controls are usually blocked in Full Auto mode, which means you can end up with unsharp, poorly-exposed pictures.

If your existing camera complies with these requirements, feel free to use it while you’re exploring your options for sports shooting. If not, consider a replacement, using the information in this chapter.

Camera choices

If you don’t have a suitable camera – or you need to upgrade to a more capable model – there are plenty of options available. But first, a word of warning: steer clear of ‘vlogging’ cameras; without a viewfinder they have the same usability limitations as the cameras in your smartphone (see Chapter 1).

Otherwise, there are three main types to choose from: compact cameras with attached lenses, interchangeable-lens cameras with ‘cropped’ (i.e. smaller than 35mm-sized) sensors and full-frame interchangeable-lens cameras with 35mm equivalent sensors measuring approximately 36 x 24 mm in size.

Compact, fixed-lens cameras are often small and light as well as relatively cheap to buy. Most have automatic modes and preset scene settings that make them easy for beginners to operate. Because they’re portable, inconspicuous and convenient to use, you can take them anywhere.

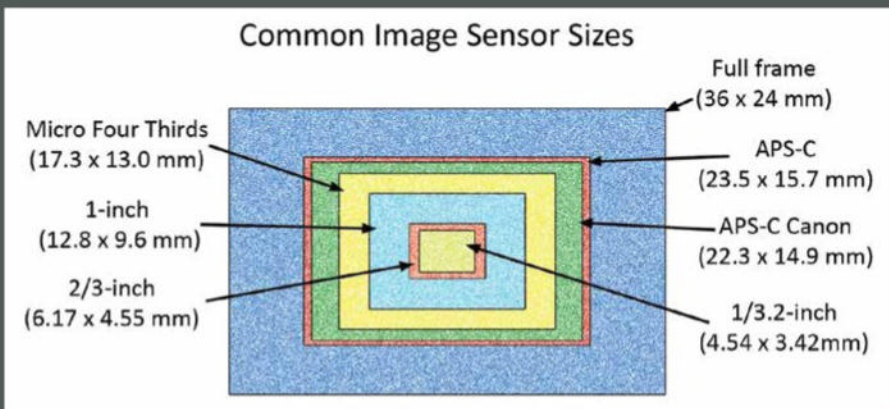
Camera sensor sizes

The size of the surface area of the sensor in your camera determines how much light it can capture with each exposure. Common sensor sizes include full-frame (approximately 36 x 24 mm), APS-C (typically 22.3 x 14.9 mm for Canon cameras or 23.5 x 15.7 mm for other brands), Micro Four Thirds (17.3 x 13.0 mm) and smaller sensors found in compact cameras and smartphones. The latter range from '1-inch' (12.8 x 9.6 mm) through 1/2.3-inch (6.17 x 4.55 mm) to 1/3.2-inch (4.54 x 3.42 mm), which is normally only found in smartphone cameras.

Larger sensors capture more light with less digital noise in dim lighting. They also make it easier to separate subjects from distracting backgrounds by keeping them in sharp focus while the background is blurred.

Sensors smaller than 36 x 24 mm record a narrower field of view, effectively 'cropping' the image compared to a full-frame sensor with the same lens. Most APS-C sensors apply a 1.5x crop factor (Canon's crop factor is 1.6x), while Micro Four Thirds (M4/3) sensors apply a 2x crop. This means a 50mm lens covers the same field of view as a 75mm lens on a typical APS-C camera – or a 100mm lens on a camera with an M4/3 sensor chip.

Note: If you're serious about sports photography and looking for a new camera, models with stacked or 'partially stacked' sensors have readout circuitry that is faster and delivers quicker burst rates and less rolling shutter than conventional sensors. They can also record a wider dynamic range with more shadow detail.



This graphic shows the relative image sizes commonly used in modern cameras to scale.

Most of these cameras have much smaller sensors than interchangeable lens cameras (see box on page 17), so they don't deliver high image quality in challenging lighting. They can also be slow to start-up and take longer to focus on subjects. Many cameras rely on automatic modes and make manual adjustments difficult to access or use.

With only one fixed lens, they're less versatile than interchangeable-lens cameras, although cameras with

extended-range zoom lenses are available. However, you can't upgrade the camera's optics if you want a different focal length or a better lens.

Some models, usually 'vlogging' cameras, lack a viewfinder so you have to rely on the LCD screen for composing your shots, which means they're not much better than a smartphone camera. In other models, the built-in viewfinder is too small to be of much use and often low in quality.

Cropped-sensor interchangeable-lens cameras come with two sensor



Capable cropped-sensor cameras like the Nikon Z50 II come with professional-level controls, making them excellent tools for sports photography. The DX 50-250mm f/4.5-6.3 zoom lens shown here covers focal length equivalent to 75-375mm in 35mm format. (Source: Nikon.)

sizes – APS-C and Micro Four Thirds. They have advantages for sports photography because their crop factors effectively get you closer to the subjects you're photographing for any given focal length.

Lenses for these cameras are usually smaller, lighter and cheaper than the equivalents for full-frame cameras. This makes them easier to handle and use.

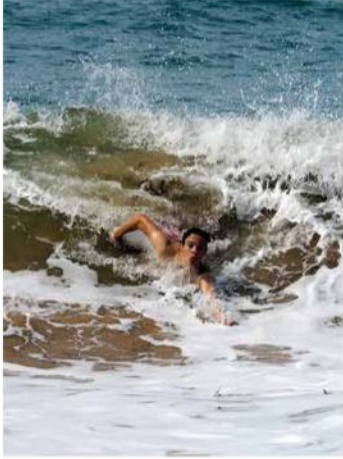
Many cameras in this category can deliver high-quality photos and videos

and some provide professional-level controls. This category is particularly good for sports photographers.

Full-frame interchangeable-lens cameras are favoured by enthusiasts and professional photographers because their larger sensors can deliver better image quality (although that can depend upon the lens in use). These cameras and their lenses are usually larger, heavier and more expensive and they can be more challenging to use.



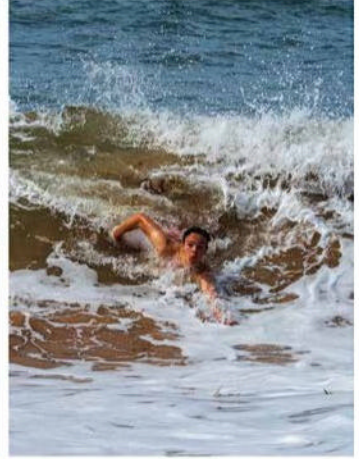
Professional photographers who work in challenging conditions and need to get great action shots generally use full-frame interchangeable-lens cameras and fast telephoto lenses. This shot was taken with the Canon EOS R5 II camera plus the RF 100-500mm f/4.5-7.1L IS USM lens at 500mm with the lens aperture at f/6.7. (Source: Canon.)



JPEG
10.2MB



HEIF
5.8MB



RAW
16.9MB

This illustration provides an example of the different file sizes for images of the same subject saved in each file format.

File formats

Traditionally, digital cameras have always stored images in the **JPEG** file format, which was developed by the Joint Photographic Experts Group and has been in use since 1992. All cameras set this format as their default so if you don't set an alternative, that's what your camera will record.

JPEGs are compressed at point of capture and the compression is 'lossy' which means you lose image data. That's convenient because file sizes are relatively small, but you can't recover data that's been discarded.

JPEGs are convenient because they can be viewed by virtually any viewing device. Their small size makes them easy to share via email, chat and social media. They are also quick to transfer and store.

HEIF, or High Efficiency Image Format, arrived in 2017 and is being increasingly implemented in professional and enthusiast cameras. Supporting colour depths of up to 16 bits, it can handle a higher bit-depth than 8-bit JPEGs, so it can record a wider dynamic range.

HEIF claims a two to one increase in compression over JPEG at similar quality levels. HEIF images can also be encoded and decoded much faster than JPEGs, without overloading the processing system or depleting the battery. However, while most current image editors include HEIF support, it's not supported in popular web browsers or for direct printing by printers.

RAW files store all of the information originally captured by the camera, which makes them much larger than JPEGs or HEIF files so they can deliver the best possible image quality. Adjustments to white balance, exposure, contrast, saturation and sharpness and filter effects are not 'baked in' and can be easily applied post-capture.

Conversion software is required to convert raw files into editable formats (JPEG or TIFF as a rule) before they can be printed or shared. Most enthusiast-level and professional applications provide a range of adjustments you can apply during the conversion process.

TIFF stands for Tagged Image File Format. It's seldom provided in cameras and when it is, it's usually through in-camera conversion of raw files. TIFF files are usually uncompressed, so they're extremely high quality and offer the opportunity for extensive post-processing. Their large size makes them unsuitable for online viewing and sharing but this format is ideal for storing images you want to print.



Cameras with face-recognition AF will outline human faces in the frame so you can see where the focus is targeted. Some cameras will use different colours to pick out the subject nearest the camera. The ability to track subjects that move within the frame is important for sports photography.



Four frames from a burst sequence showing the ability of continuous shooting to record the details of sports action.

Features to look for

The best sports photography cameras should have at least one of the three features listed below.

1. Subject recognition autofocus and tracking. Almost all current cameras include algorithms that can lock focus on the face or body of a human subject (usually the person closest to the camera). More sophisticated cameras can identify each of the subject's eyes and will focus on the one closest to the camera by default, although some cameras let you choose which eye to focus on.

Enthusiast-level models can detect a person when they are facing away from the camera or their faces are partly obscured. Most can also identify and track subjects like animals (including birds) and vehicles (including cars, cycles, planes and trains). Some have additional modes for tracking insects and drones.

Once a subject is detected, it's usually outlined with a box or frame on the viewfinder screen, showing you where the lens is focusing. As the subject moves, the selection box should move with it. When the subject exits the image frame, the system should be able to detect another similar subject in the field of view and instantly switch to it. Find out more about this topic in Chapter 5.

2. Fast continuous shooting speeds and large buffer memories.

Continuous – or 'burst' – shooting modes have been around since film cameras, although today's cameras are faster and more efficient. They're popular with sports photographers for helping to capture 'decisive moments' in fast-paced games.

This mode is selected from the camera's Drive menu (which is covered in Chapter 8). It sets the camera to record frames continuously while the



shutter button is held down. Recording continues until the button is released, the camera's buffer memory fills up or the memory card(s) run out of storage space.

3. Pre-release capture. This function has been introduced in recently-released higher-end cameras to help photographers deal with unpredictable action. It is covered in detail in Chapter 8.

Lens choices

Lens choice varies with the venue and how far you are from the action. For field sports like football (all varieties), cricket,

baseball, and softball, a longer zoom lens with a reach of at least 200mm is needed (300mm is better). A 70-200mm, 70-300mm, or 100-400mm will get you close to the action without putting you at risk.

Where you're reasonably close to the action, a 24-70mm or 24-105mm lens should provide the scope you need to cover the players from close-up to mid-court. Extended-range zoom lenses (which are often the first lens beginners acquire) can also be used and are normally



Wide-angle lenses are great for 'ambience' shots of venues or behind-the-scenes preparations for an event. This shot was taken with a 16mm lens on a full-frame camera, which encompasses a much wider-than-normal field of view.



A 600mm focal length lens allows you to take dramatic close-ups of dinghy sailors. The perspective compression created by such a long lens enhances the drama, while the fixed f/11 lens aperture keeps subjects in the background identifiable. © Nick Brown.

versatile enough to cover most camera-to-subject distances for most sports.

However, these lenses are generally quite slow – with maximum apertures that are often as small as f/4 at the wide end and f/6.3 or f/7.1 at the telephoto end of their range. You need to jack up the camera's ISO sensitivity to get shutter speeds fast enough to capture any action.

Where you're further from the action, for instance when shooting sailing dinghies racing, you need an even longer lens; 250mm is the minimum focal length to consider, with a 100-400mm zoom close to ideal. We've had success with Canon's RF

600mm f/11 IS STM lens, even though its fixed f/11 aperture is relatively slow. An example is shown on this page.

In most cases you should be shooting at a minimum speed of 1/500 second, although 1/1000 second or faster is preferable for obtaining reliable results. Chapters 5 and 6 provide more information on this topic.

Useful links

Lightweight camera kits

www.tinyurl.com/lightweight-cameras

Waterproof and action cameras

www.tinyurl.com/adventure-cameras

CHAPTER 3

THE NEED FOR SPEED



The Canon EOS R6 Mark II camera and 35mm lens used by photographer, Alex Moysan, to record this action shot of a cycling peloton were as fast as you could get at the time the shot was taken. Nonetheless, fast memory cards were essential for securing the shot. © Alex Moysan.

Because sports photography usually involves capturing fast action, this chapter is devoted to equipment speed. Speed influences all aspects of your equipment.

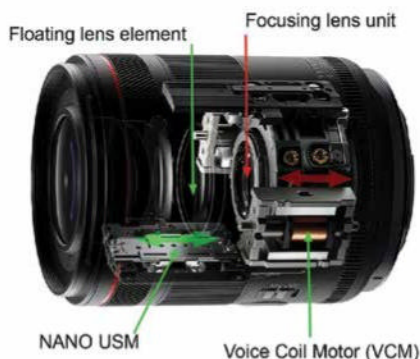
For starters, your lens must support fast and accurate autofocus. Then the camera comes into play with the data processing speeds of the image sensor and image processor(s). The write speeds of the memory cards on which the images are stored completes the capture process. Let's take them in succession.

Lens focusing

Three factors dictate the autofocus (AF) speed of a lens: the drive motor that adjusts the position of the focusing element(s), the size of the lens aperture and the data processing systems in the camera, and lens hardware and firmware. Focusing itself is a straightforward process: the camera detects the distance to the subject and passes this information to the lens, then the processor in the lens adjusts the optics to bring the subject into focus.



Focusing on the main subject in this shot required the use of both contrast detection and phase detection AF, with the bright, reflective surface of the water adding further complications to the challenges of keeping the subject in focus.



This illustration shows the structure of the electronic focus control mechanism in which a VCM (Voice Coil Motor) does the heavy lifting of moving the focusing lens group while the compact, energy-saving Nano USM adjusts the lightweight floating lens to fine-tune the focus. (Source: Canon.)

How quickly this occurs depends on the focusing method and available light levels. Traditionally, contrast detection (CDAF) – where the lens is moved to establish the greatest contrast between adjacent pixels on the sensor – has been popular with camera manufacturers. Phase-detection AF splits light entering the lens into pairs of images and compares the intensity differences (peaks and valleys) between the pairs.

Phase detection AF (PDAF) can quickly detect whether the subject is near or far and calculate how far to move the lens. Today most cameras use a 'hybrid' system that uses on-sensor PDAF points for quick initial focusing

and tracking, then switches to CDAF for fine-tuning of sharpness. This combines speed with precision and is ideal for sports photography.

Unfortunately, some things can slow autofocus performance. The most common is dim, low-contrast lighting, which can cause the lens motors to drive the focus back and forth as the camera 'hunts' for a sharp edge.

Highly reflective surfaces (like water) or subjects with dense, repetitive patterns can confuse the AF sensors, making it hard for the camera to isolate the target. The type of drive motor the lens uses also plays a role in lens speed.

Most lenses use one or more of the following types of drive motor:

1. Stepping (or stepper) motors (STM) physically move the focusing elements in small, precise increments.
2. Ultrasonic motors (USM) use piezoelectric elements to convert vibrational energy into rotational motion, which moves the focusing elements.
3. Linear motors move the focusing elements in a straight line using electromagnetic fields.
4. Voice Coil motors (VCM) use a magnetic field to drive the focusing elements.
5. Screw/gear type AF systems use a simple motor in the camera body or lens that turns a screw to move the focusing elements. (This type of AF drive is seldom used in modern lenses because it's not fast enough.)

Ultrasonic motors (USM), linear motors and Voice Coil motors (VCM) are the fastest. Canon's ring-type USM is often cited as the fastest and most robust, with Tamron's VXD (Voice-coil eXtreme-speed Drive) linear motor a close competitor.

While high speed is important, smooth and quiet operation is also critical for video. Nano USM and VCM can provide this smooth, silent performance alongside fast responses for video capture.

Camera speed

The speed and efficiency of image processors usually increases with each successive generation. This is another advantage of having a recently-released

camera. Developments like stacking the electronics behind the image sensor and boosting data offloading speeds make the sensors and processors in the latest cameras much faster than before.

You'll need these speeds to support high-speed continuous shooting of high-resolution photos and video recordings. That requires fast, high-capacity memory cards (see below).

Check the specifications list when you're shopping for a new camera and, if in doubt, ask the staff member who is serving you whether the camera's processor is the latest model. But remember, it's only one component in the imaging chain; the memory card(s) your camera uses



Regardless of what type of autofocus system your camera uses, it is always easier to focus on subjects coming straight towards you than those moving across your field of view.

can determine whether it utilises the focusing speed of the lens and the camera's data processing speeds.

Memory cards

Your camera dictates which type(s) of memory cards you can use. Lower-priced and older cameras usually have a single media slot for SD (Secure Digital) cards.

SD cards come in three capacity levels: Standard SD cards go up to 2GB; SDHC (High Capacity) cards range from 4GB to 32GB, and SDXC (Extended Capacity) cards go from 64GB up to 1TB (and maybe higher in the future).

Many cards show 'Class' numbers between 4 and 10, 'V' ratings (typically V60 or VB90) and/ or the number 1 or 3 inside the letter U. The class numbers

refer to the card's minimum-rated sustained write speed. Class 4, 6, or 10 cards should maintain speeds faster than 4, 6, or 10 MB/s, respectively.

The V rating denotes video write speeds. V60-rated cards have a minimum write speed of 60 MB/s, while V90-rated cards have a minimum write speed of 90 MB/s.

SD cards are also split into three UHS speed classifications. Cards without a UHS rating have a maximum speed of 25 megabytes per second (MB/s). UHS-I cards max out at 104 MB/s, and UHS-II cards have a second row of pins on the back that helps to achieve speeds of up to 312 MB/s.

Recently-released cameras that support high-resolution video (at 4K/60p, 6.2K or 8K resolutions) often



Additional processors, like the DIGIC Accelerator chip in Canon's professional cameras, significantly increase image processing speeds. (Source: Canon)



This illustration shows the information you can use to evaluate the performance of an SD card. (Source: Lexar.)



CFexpress Type A cards suit Sony cameras and lightweight setups; while Type B delivers higher 4.0 performance and wider camera support. (Source: Lexar.)

have two media slots, one for SD cards (usually SDXC UHS-II) and the other for CFexpress cards, which are faster and generally have higher maximum capacities. Some may have two SD slots, while others accept two CFexpress cards. While all CFexpress cards are based on a standard developed by the CompactFlash Association, different camera manufacturers have adopted different CFexpress formats.

Sony cameras use CFexpress Type A cards, which have a similar form factor to SD cards but measure 28 x 20mm and are 2.8 mm thick. This lets Sony make cameras with slightly smaller, lighter bodies and offer the convenience of media slots that can accept both CFexpress and SD cards.

All the other manufacturers so far use the larger, Type B format cards, which are roughly twice as fast as Type A cards.

Capacity	Approx. JPEG photos at 24MP	Approx. 24MP - uncompressed RAW files	Approx. minutes of 4K video (30 Mbps)	Approx. minutes of 8K video (60 Mbps)
1TB	428,785	12,800	2,083	1,042
512GB	214,286	6,400	1,042	521
256GB	107,143	3,200	521	260
128GB	53,571	1,600	260	130
64GB	26,786	800	130	65
32GB	13,393	400	65	32
16GB	6,696	200	32	16
8GB	3,348	100	16	8

They measure 38.5 x 29.8 mm and are 3.8 mm thick and are available in a wider range of storage capacities. They are better at high-speed data writing because they have more pathways (PCIe lanes) for transferring data.

Currently, the highest storage capacity for CFexpress Type A cards is 1.92TB, whereas Type B cards are available in capacities up to 4TB. The table above shows typical storage capacities for image and video files.

Interestingly, SD and CFexpress cards handle data differently. With SD cards, the camera is entirely responsible for how the image data is transferred to the card. CFexpress cards have a built-in memory controller that manages how the data is stored in the card.

Technically, if something goes wrong, most images on an SD card can be recovered after write, deletion or storage cell errors. In contrast, with CFexpress cards, you can't recover images once card structures are breached.

Most cameras that use CFexpress cards have large buffer capacities for burst storage, with the smallest raw file capacities typically being around 70-80 files and the largest around 1000 files. Unfortunately, CFexpress cards cost more than SD cards with equivalent capacities because the newer, faster technology involves higher production costs and more specialised components.

If you really need the card speed and/or both speed and capacity for fast burst shooting or high-resolution video recording



An increasing number of enthusiast-level cameras now provide dual media slots with one slot accepting CFexpress cards and the other SD cards. This enables photographers to use the faster CFexpress cards for storing high-resolution video clips and extended high-speed bursts of stills. (Source: Canon.)

it's usually worth the investment. But if you only shoot stills and seldom record fast bursts of uncompressed raw files, a CFexpress card could be over-kill.

If you've purchased a Sony camera you should be safe to use appropriate SD cards in the CFexpress Type A slot. They won't be as fast as a CFexpress card but they may be fast enough for your requirements.

Battery capacity

While you're checking the camera specifications for details of its image processor and the memory cards it uses, it's worth scrolling down to check the battery capacity. Most cameras publish CIPA ratings, based upon standardised

Making memory cards last

Follow these practices to ensure your camera's memory cards remain usable over the long term:

1. Format the card in your camera before each use. This ensures the structure on the card matches what the camera thinks it should be.
2. Don't share cards between cameras. The DCF specification triggers a sub-folder for each camera, which can make it more difficult to find the file you're looking for.
3. Only delete files on your camera if you have to. Deletion is a different function from storing and can trigger storage problems.
4. Memory cards have finite life spans. SD cards are more vulnerable to cell write death than actively managed CFexpress cards. It's good practice to buy new cards when you buy a new camera and retire your old cards at that point.



measurements conducted by the Japanese Camera & Imaging Products Association.

These involve taking a photo every 30 seconds with intermittent use of flash and lens zooming. All measurements are made with normal usage modes; energy-saving modes aren't measured.

The CIPA ratings are a useful guide to comparing battery life between different cameras. However, they don't necessarily relate to your real-world usage of a camera, where the actual battery capacity is influenced by factors like how often you review photos, use video features, or connect to Wi-Fi or Bluetooth. Use of functions like the electronic viewfinder (EVF), continuous autofocus, image stabilisation and built-in flash will drain the battery faster than the CIPA test accounts for.

Camera batteries come in different sizes and capacities, with larger batteries offering better performance as a rule. With the increase in direct USB charging capabilities, few modern cameras come with separate battery chargers, although these can be handy when you have spare batteries to charge.

Useful links

Fast, high capacity cards

www.tinyurl.com/fast-cards

Workflow and backup

www.tinyurl.com/workflow-backup

CHAPTER 4

STRATEGIC PLANNING



A cricket match in a local park provides a great way to polish your sports shooting skills.

Sports photography is, in essence, all about capturing people in action and showing what's going on. A great shot can encapsulate that 'story' in a single image – although sometimes it's better to record a sequence of images covering a particular move or the event as a whole. You could also shoot a video.

A lot depends upon the nature of the sport you're photographing and your angles of view. Preparation and planning

are likely to provide more opportunities for photographing a sports event.

Check out venues

Start with places in your locality where people engage in sports. It doesn't matter what sport it is – or the proficiency of the players. These places are ideal for learning and practicing different shooting techniques.

Knowing the venue allows you to scope out the best places to stand. You need to

be close enough to the action to at least come close to filling the image frame with the actions you want to capture – but not so close as to get in the way or risk being hit by a bat or ball.

It's also important to work out which parts of the venue will be in shadow at different times of the day – so you can avoid them. Shadows can be used effectively in sports shots, but they can also obscure players' faces and occasionally result in confusion about what's going on in the shot.

Trial and error should show you what works – and what doesn't.

Most of the time while you're still in the learning phase you won't need to ask permission to take photos unless your presence is really obvious. If you're shooting up-close and when you know the players, it's good manners to check it's OK to shoot. Many people won't mind you using them for shooting practice – although some may object if you're photographing their young children (this is a sensitive matter for many parents).



Shadows on players can obscure their faces but how dark they are will often depend on the time of day and season of year as well as the prevailing weather. Cameras that provide adjustments for highlight and shadow compensation can help you to minimise this problem.

Once you've mastered the basics and want to move on to larger venues, it's a good idea to visit each venue you're considering before the activity takes place so you can see the lay of the land and the direction(s) of the light at different times during the event. Good light is particularly important in sports photography where it can make a difference between being able to capture details in the players' faces and having them either too dark or too light for any details to be recorded.

Many sports take place around the middle of the day, when the sun is overhead and shadows are short and dark. However, some occur in indoor venues where artificial lighting dominates. Be prepared to take on the challenges of different situations.

The best pictures are often taken in challenging conditions. Football matches in the rain can provide opportunities to take dramatic shots of players covered in mud or vehicles skidding around corners on wet roads.

As a general rule, your shooting position should have most of the light behind you. You want your subjects to be illuminated by the sun as they approach, particularly in summer, when the light around the middle of the day (when most sports are played) can be very harsh.

Harsh lighting can cause shadowed areas to be recorded as deep black and bright highlights as stark white without details.



Deep shadows can make it difficult for your camera to record the full range of tones in the scene. The top image shows the scene as captured in JPEG format, while the lower one shows an edited version taken from a raw file, which captures a more realistic brightness range.

Most modern cameras have menu settings that can moderate this harsh lighting – at least to some degree. You can find out more about them in Chapter 6.

These controls provide some degree of in-camera correction on JPEG files as they are recorded. However, you'll almost certainly end up with better results by shooting raw files and learning to convert them into editable formats (JPEG or TIFF) in your image editor. (Find more on this topic in Chapter 8.)

Shooting in the rain

Even if your camera is weather-resistant, try to keep it from getting wet. If there's a threat of rain, make sure you have protection for your camera available because water can damage its electronics.



Sports that can take place in the rain provide great opportunities for action shots. A combination of strong winds and rain in mid-January 2026 brought several wingfoil kite surfers to the upper Parramatta River. © Nick Brown.

'Weather-resistant' cameras with normal IP1 ratings should be able to withstand a brief, light shower – but most require additional protection. Cameras and lenses that are IP53 rated allow you to work in fairly heavy downpours but so far only OM System makes equipment with this rating.

As well as dedicated rain sleeves (ask at your local camera shop), you can use makeshift solutions like plastic bags or shower caps to cover the camera body and lens. Fitting a lens hood will give additional protection for the front element of the lens, preventing shots from becoming unusable due to water on the lens.

Keep the wind at your back with the camera level wherever possible so the rain won't fall directly on the lens. Use absorbent, lint-free cloth to wipe off water droplets during your shoot and give your equipment a full wipe down after the shoot – including fully extending the lenses – so moisture doesn't seep into the joints in your gear. Allow everything to dry for at least 24 hours before using it again.

Outside of IP ratings, the best that most camera buyers can expect from manufacturers is a list of limitations to water, dust, temperature and impact resistance, which are normally only provided for truly waterproof cameras that can withstand immersion. All weather-resistance claims require the camera body to be paired with a similarly-rated lens if you want to use it in any situation where it might get wet or dusty.

Subtle lighting on overcast days can be easier to work with because the brightness range in the scene is within the scope of the camera's sensor. This kind of lighting will reveal colours in their true tones and make your images more natural looking.

Winter light is also less contrasty than light in summer and, therefore, easier to deal with. Early spring and late summer can provide similar – although usually a little brighter – conditions, along with longer days on which you can shoot.

Indoor sports

How you photograph indoor sports is largely dictated by the lighting. When you're shooting sports like basketball or netball in a windowless gym, try to position yourself so the lights don't shine directly at your camera. Your camera's default auto white balance setting (which controls how colours are rendered) should deliver fairly neutral results under the kinds of lighting that are commonly used.

Problems can occur in poorly-lit conditions, when you have to balance the fast shutter speeds required to 'freeze' action against potential image noise interference at the high ISO settings needed to support them. Image noise makes your photos and videos appear granulated so it's best avoided.

You might be tempted to use a flash (either the camera's built-in flash, or even a flash unit attached to the hot shoe) to

shed more light on the scene. But that's not recommended for three main reasons:

1. Built-in flashes won't deliver enough light to allow correct exposures of subjects beyond a metre or so from the camera because the light falls off quickly as the camera-to-subject distance increases. Add-on flashes may be more powerful, but most can't reach far enough.



Winter light is kinder to subjects and also makes it easier to obtain photographs covering a wide brightness range in the scene.



Indoor sports like basketball can be photographed from the stands, particularly if you are slightly above the players.

They also create a pool of light close to the camera, leaving the background too dark to see much detail.

2. Flashes can be very distracting for players – and other spectators.

3. Flash use chews up battery power. It's better to invest that power in supporting bursts of continuous shooting when the action happens.

For sports like basketball and netball in indoor venues, the prime shooting spots are close to the court and main action. You risk having a player crash into you when they're trying to save a ball from going out of bounds so you must stay alert to what's going on around you.

For some sports, such as ice hockey, skating, handball and roller sports, safety requires spectators to be kept well off the track. This can mean you have to shoot through mesh or glass walls, which will obstruct your view. Using the maximum aperture of a fast lens can sometimes help, but it's often better to move to another position, even if it's further from the action.

Useful links

Lenses for sport

www.tinyurl.com/lenses-sport

Ryan Pierce pro photographer

www.tinyurl.com/ryan-pierce-pro

CHAPTER 5

FOCUSING AND EXPOSURE

Choosing the ‘right’ focusing mode can be difficult when your subjects are in constant motion. So, how do you go about getting focus and exposure right as much of the time as possible? Your camera’s focusing and exposure modes can help you.

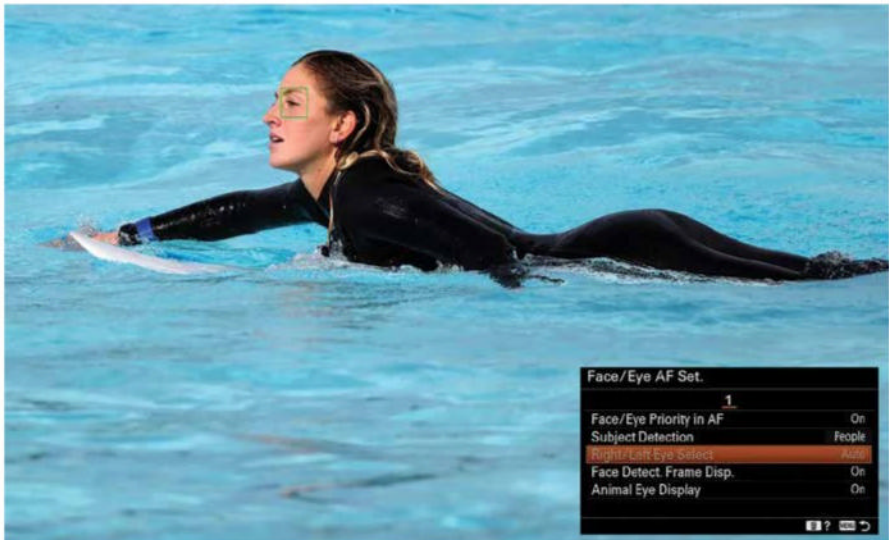
Focusing modes

The following tips will help you to set the optimal focusing mode for different situations:

1. Understand how the focusing system in your camera works.

Most cameras these days have ‘hybrid’ AF systems that combine the speed of phase-detection AF (PDAF) with the precision of contrast-based AF.

Phase detection is used to obtain a quick focus on where the subject is, while contrast detection data locks the focusing elements in the lens onto the highest-contrast edges in the chosen subject.



The latest cameras provide useful aids to help the lens focus on the area you want. The inset shows some of the menu settings in an enthusiast-level camera.

Together they achieve the sharpest possible outcome.

2. Select the right AF mode. In most situations, the AF-S or One-Shot AF, which locks focus on a single point, will be the best setting to choose because it is faster to lock onto the subject and doesn't keep trying to change focus. However, when you're shooting video or recording fast bursts of shots of moving subjects, Servo or Continuous AF sets the camera to adjust the focus continuously to track the motion.

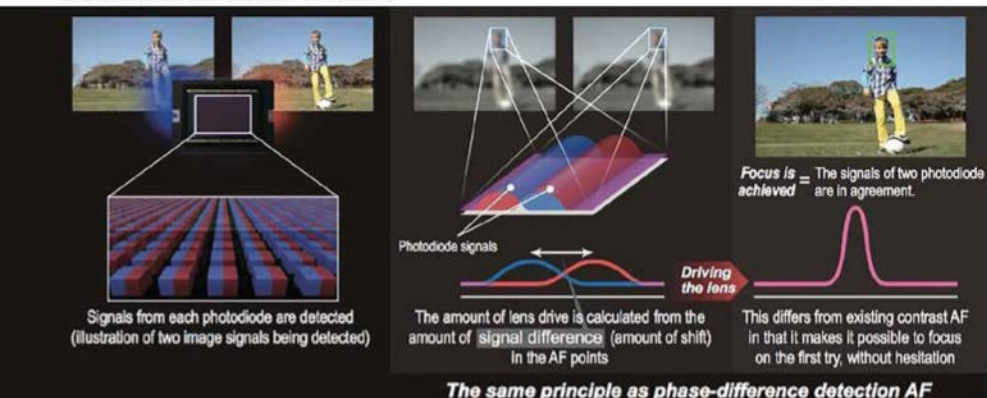
Many of the latest cameras come with special, 'predictive' AF algorithms that can predict where a subject will be at the moment of exposure. The process relies

on the photographer half-pressing the shutter button while framing the subject, which focuses the lens close to where the subject is. The focus locks on when the shutter is actually released. In most cases, this setting is only supported in the continuous AF mode.

If you find the lens 'hunts' back and forth trying to find an edge, you'll need to take manual control. Many lenses support manual focus over-ride when set in AF mode and some lenses have a 'clutch' mechanism that lets you slip between AF and MF quickly by just pulling back or pushing the barrel forwards.

You can minimise the chances for hunting with a technique known as

Dual Pixel CMOS AF structure



This illustration shows the difference between Dual Pixel AF and Hybrid AF, the latter embedding phase detection pixels among the imaging photosites. This enables the camera and lens to measure the subject distance from the focal plane very quickly, while the contrast AF can check for exact focus very accurately. (Source: Canon.)



This illustration shows the distribution of AF sensor points in a typical pattern for an enthusiast- or professional-level camera. When subject-recognition AF is engaged, the camera will automatically focus on the human subject's face and outline it, as shown here.

‘zone focusing’, which involves pre-focusing manually on where the action is likely to be (for example, the batsman in front of the stumps or plate or the tennis player serving). When the subject enters the focused zone, it's simply a matter of timing the shot to record it.

3. AF point selection. All modern cameras provide at least three AF area modes, typically multiple, single-point and area selection. If you know roughly where the action will occur, selecting a smaller area and positioning the AF

sensors on it can help the lens focus faster. With continuous AF, selecting the multiple AF mode allows the camera to choose its own focusing point for locking onto the subject. This setting can work well with subject-recognition AF.

4. AF Lock. AF Lock lets you lock the lens focus of your camera during shooting. It's engaged when you press the shutter button half way down (which also locks exposure) or when you hold down the AF Lock button (shown in the illustration on the next page).



Some cameras have separate AF and AE Locks, as shown in the upper model in this diagram. In others, like the lower model, the two functions are combined into an AE/AF Lock.

AF Lock keeps the focus on a selected part of the scene, allowing you to re-frame the scene so the main subject isn't centered. AF lock is useful in situations where your camera might struggle to find the right focus point; for example, when shooting through fences, glass or other impediments.

It also lets you anticipate your subject moving into a specific area, pre-focus and lock focus then wait for the perfect moment. It's easiest to use when your camera is set to focus on the centre of

the frame. You just focus on the subject, lock focus and track the subject until you're ready to capture the 'decisive moment'.

Watch what the focus system is doing. Different manufacturers use different strategies. Nikon cameras don't lock exposure/focus by default when the shutter is half-pressed; Canon cameras require use of One-Shot AF mode for AF Lock.

Most cameras let you reconfigure the settings to separate the AF function from the shutter button. This **back button focus** technique lets the photographer lock focus with the AF Lock button and use the shutter button just for taking the picture. It can be useful for fast-moving subjects and gives the photographer greater control as well as making it easier to switch between single-shot and continuous focus modes.

5. Subject-detection AF. Almost all modern cameras come with face and eye recognition for human subjects – and many include these features for photographing pets and other animals. Recently, subjects like cars, trains and airplanes have been added to the target subjects, along with sub-categories for detecting and tracking birds, insects and drones.

Selecting a particular subject to target will make the AF system locate it anywhere in the field of view and stay locked on it until it leaves the frame, even when it is momentarily obscured by an

In many cameras you can set the focus to prioritise either the near or more distant eye. Many cameras are able to ‘recognise’ and track people whose faces are partly obscured by glasses, goggles, hats or helmets. These facilities can be really useful for sports photographers – but you must spend time learning what they can (and can’t) actually do to discover how best to use them.

in the camera – and even prioritised in order of importance. This makes the camera automatically attempt to detect and track those faces in a scene. Another professional facility is an Action Priority AF system that can automatically recognise and focus on specific types of action in football, basketball and volleyball.

Predictive focusing, which engages autofocus when the shutter button is half-pressed, scans the scene to detect a subject and then measures the speed and direction of its motion – all in a matter of milliseconds. When the shutter release is fully pressed to take the shot, the camera can determine the speed



and direction it's moving in and keep it in focus. If there's a sharp change in the focus distance, the camera will smoothly shift focus, based on previous successful results.

Leading manufacturers also provide special modes for prioritising focus on the main subject when photographing sports. In most cases they use advanced algorithms ('deep learning') to analyse

the scene, identify the ball or player and shift focus to keep it sharp, despite distractions.

Canon's Action Priority AF, which was introduced in the EOS R1 and R5 Mark II cameras, is the first to offer settings for particular sports. So far, the only sports identified specifically are soccer, basketball or volleyball, although other sports are likely to be added.



Predictive autofocus works well in movie mode, as shown in this sequence of frames from a Panasonic G9 II M4/3 camera. Note how well the focus tracks the moving subjects, even when the lens is zoomed in from a wide position. (Source: Panasonic.)

Canon's AF 'Case' settings

The focusing menus in many Canon EOS cameras include 'Case' settings containing preset combinations covering various types of action and movement. The main adjustments covered are tracking sensitivity, acceleration/deceleration tracking and AF point auto switching. These parameters control the way the camera responds to movement.

Case 1, which is shown with a sprinter icon, is a versatile, multi-purpose setting that works best for subjects moving at a constant speed. It's a good setting for panning shots.

Case 2, shown with a tennis player icon, is designed for sports where the main subject could be temporarily obstructed or move away from the AF point.

Case 3, indicated with an icon showing two cyclists, suits situations where a subject might suddenly appear in the frame. It's best used when you want the camera to refocus very quickly on a new subject and where you can keep the AF area over the subject you want to be in sharp focus.

Case 4 is shown by a footballer icon. It's designed for use when photographing subjects whose speed of motion and direction can vary suddenly and is ideal for shooting football, rugby, basketball and hockey, as well as motorsports.

Case 5 has an ice skater icon and is able to keep the focus on erratic subjects moving quickly in any direction. It's good for sports like figure skating and tennis.

Case 6 is indicated by a rhythmic gymnast and can keep focus on subjects that change speed and direction erratically. It works best when the AF point or zone can move easily around the frame. Don't use it with Spot AF or Manual focus selection.

Note the additional settings in the 'Case' menus for adjusting tracking sensitivity, acceleration and deceleration and AF point auto switching. These are provided so you can further customise each 'case' to suit individual shooting situations.



The illustration here shows the menu pages for each Case setting provided.
(Source: Canon.)



Canon's Action Priority AF settings have been 'trained' to identify the common actions performed when playing soccer, basketball or volleyball. They can recognise both athletes and the ball for these sports and will focus accordingly.

When a specific mode is selected, it primes the camera to find the player taking a shot at the goal, making a pass or performing another dramatic action. This means the photographer is less likely to miss key shots.

Other manufacturers provide similar – but less specific – subject-tracking modes that can be helpful for tracking the unpredictable actions common in many sports, although they're not singled out. Canon provides similar AF settings in most other cameras in its line-up.

Useful links:

Autofocus tips

www.tinyurl.com/autofocus-tips

Autofocus systems

www.tinyurl.com/autofocus-systems

CHAPTER 6

GETTING EXPOSURE RIGHT



This shot was taken in Aperture priority AE mode using a wide lens aperture of f/2.8 to blur the background while keeping the subject sharply focused. A long focal length of 200mm provided good separation between the subject and the background.

There's no point in having the lens focused on the subject if exposure settings mean it will be too dark or too pale for details to be recorded. Consequently, most modern cameras link AF and exposure modes by default so, if your subject is in focus, it should also be correctly exposed.

Unfortunately, with sports photography you'll find sometimes it isn't, particularly where you're shooting fast-moving targets. Dealing with the brightness range of the scene can also present problems, particularly on a bright, sunny day. (See the box on page 52)

Problems occur when your main subject is silhouetted against a bright background or recorded with washed-out details when the background is much darker. This chapter offers advice to help you avoid situations like these.

Exposure modes

Avoid the Full Auto setting when taking sports photographs because it takes away your ability to control key camera settings. Instead, use any of the following shooting modes if you want the best results.

The easiest is the 'P' mode, which stands for Programmed auto exposure.



It can be difficult to ensure your subject remains correctly exposed and in focus when it is moving quickly against a background with changing brightness levels – particularly in scenes with the wide brightness ranges you find when photographing winter sports. © Alex Moysan.

Dynamic range factors

Dynamic range describes the range of tones from the darkest to the brightest parts in a scene. In most outdoor environments it's slightly greater than human eyes encompass – but much wider than most cameras can handle, as shown in the diagram here.

Cameras with large sensors generally record the widest dynamic range. Smartphone and compact camera sensors, being much smaller, require additional processing applied to JPEG files, either in the camera or post-capture.

Many cameras also have special settings for increasing the recorded dynamic range. Some also offer dedicated, multi-shot HDR modes that combine a set of exposures at varying exposure levels.

Canon's dynamic range settings include Auto Lighting Optimiser (ALO)

and Highlight Tone Priority (HTP) to preserve detail in bright areas.

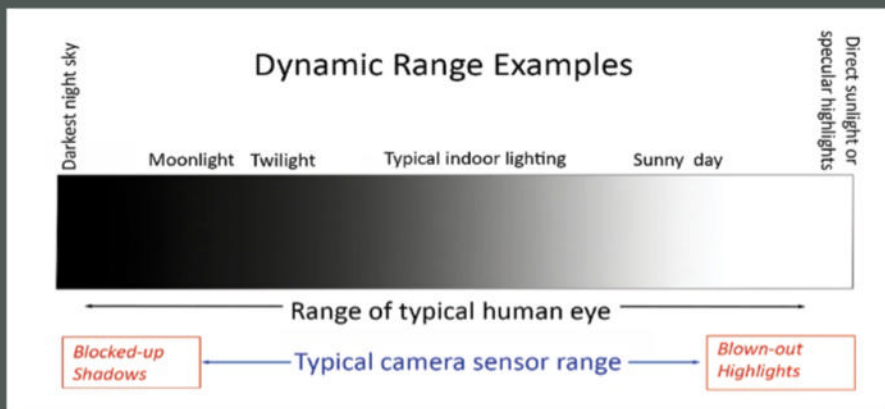
Fujifilm provides selectable Dynamic Range (DR) settings (DR100%, DR200%, DR400%, Auto), which adjust ISO sensitivity to underexpose bright areas and lift deep shadows.

Nikon has similar settings to Canon with four Active D-Lighting (ADL) settings (Low, Normal, High and Auto).

OM System (Olympus) cameras provide user-adjustable functions like Highlight & Shadow Control.

Pentax provides in-camera Highlight Correction and Shadow Correction functions.

Sony cameras have a Dynamic Range Optimiser (DRO) function for adjusting shadows and highlights in JPEGs, which provides adjustment levels from Auto to 5.



This illustration shows typical dynamic ranges for human vision and camera sensors, compared with the real-life brightness range we experience.

Log profiles are commonly used for video recording and some manufacturers provide 'flat' picture profiles, which reduce contrast, sharpness and saturation in order to capture more detail in highlights and shadows.

When shooting stills, recording images as raw files will capture a wider range of tones across the scene's brightness range. The more tones the file contains, the better able you are to bring out recorded details in both highlights and shadows. That's why it's worth using high-bit-depth files for scenes with wide brightness ranges.

Some recent cameras provide a HEIF (High Efficiency Image Format) alternative to JPEG for stills. This has a higher, 10-bit depth than 8-bit JPEGs, which means it can record a wider range of tones, although it's not as wide as raw files, which are typically 12-bit or 14-bit. The table below compares the tonal depths that can be achieved at different bit depths.



This pair of images shows the difference in the range of tones recorded in a raw file (top) and a JPEG (below), captured simultaneously in very contrasty lighting.

Bit depth	No. of tones recorded per channel (red/green/blue)	Total tones recorded
8-bit (JPEG)	256	16.7 million
10-bit (HEIF)	1,024	1.07 billion
12-bit (RAW)	4,096	68.7 billion
14-bit (RAW)	16,384	4,398 trillion
16-bit (TIFF/Advanced RAW)	65,536	281,474 trillion

This setting automatically sets both lens aperture and shutter speed but, unlike the full auto mode, doesn't stop you from changing other parameters so you can easily make further adjustments.

The 'A' mode stands for Aperture priority auto exposure; you set the lens aperture, while the camera determines the shutter speed. As with the P mode, other parameters remain adjustable. Aperture adjustments allow you to control how much depth in the scene remains sharp.

Wide aperture settings – indicated by the smallest f-number – let you blur out distracting backgrounds and support fast shutter speeds. However, it's best to stop the aperture down to f/8 or smaller for a greater depth-of-field in 'establishing' shots showing the venue.

In the 'S' mode, you control shutter speeds and can decide between using a fast shutter speed to 'freeze' action or a slow one to get shots showing motion blurring. You may need a tripod when using shutter speeds of a second or more.

In Manual mode, which is marked by an 'M', you must control all the settings. You should only use it when you have a particular objective in mind. On the downside, it requires constant readjustments.

Some manufacturers add Custom memory banks (shown on the mode dial by the letter 'C' plus a number).

These let you store combinations of camera settings you use a lot so they are quick to access when you need them. Many also provide a 'B' ('bulb') mode that sets up the camera for very long exposures outside of the default shutter speed range.

Other modes you might find are dedicated movie modes, scene pre-set modes and filter modes that access a library of pre-programmed special effects. Your camera's user manual outlines what's available.

Metering modes

All modern cameras have integrated light meters to measure the light reflected from the scene.

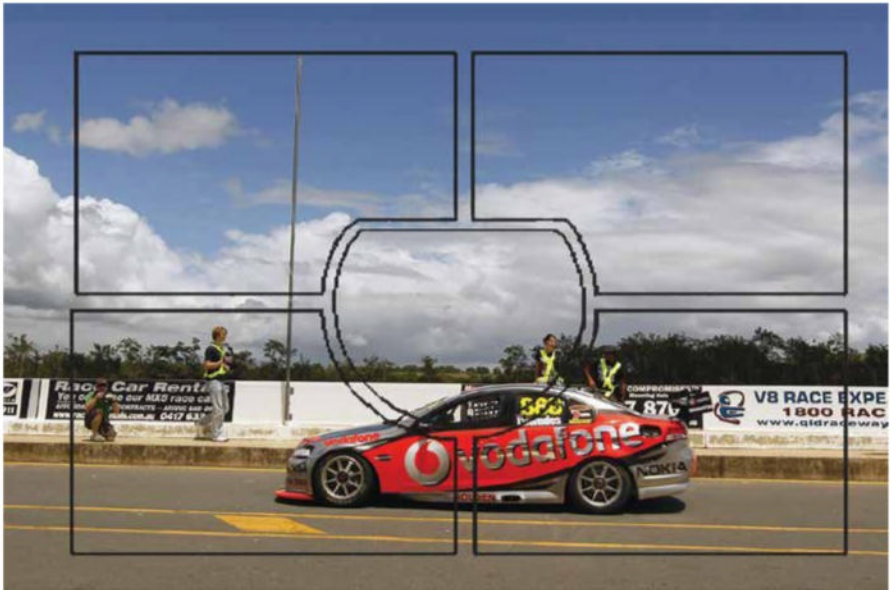
Most cameras' meters use one of three metering patterns:

1. Evaluative, Matrix or Multi-pattern metering splits the frame into a series of 'zones', which are analysed to detect the balance of dark and light tones. This mode is ideal in scenes with a wide range of tones, such as those containing large areas of bright sky. Some cameras also measure colour, subject distances, highlights and shadows and many also use focusing information to prioritise the area you focused on.

Most cameras default to multi-pattern metering because it works well for many subjects and takes account of differences between a bright sky and darker foreground. But it doesn't necessarily ensure you'll get the best results.



This illustration shows the Custom memory banks on the mode dial of a flagship Micro Four Thirds system camera. (Source: OM Digital Solutions.)



Evaluative metering usually gives well-balanced exposures in scenes like this where there is a large area of bright sky.

2. Centre-weighted average

metering prioritises measurements from the centre of the frame, largely ignoring the corners. It's useful when subjects are in the middle of the frame and can work well for sports action.

3. Spot metering only measures roughly 2% of the frame around the focus point, ignoring everything else. Canon cameras include a Partial metering mode that measures roughly 6% of the frame. Both modes are ideal for shooting backlit subjects and worth

using for photographing sports action.

Many cameras also provide a Highlight priority metering mode, which is designed to prevent the brighter areas from being over-exposed. It's usually indicated by an icon like the spot metering icon but with a star beside it. Use it carefully as it may cause the rest of the scene to be under-exposed.

You can manually over-ride the exposure settings with exposure compensation, which is outlined in the box on page 57.



Centre-weighted average metering places greater importance on measurements from the centre of the frame. It works best in scenes with relatively even lighting when subjects occupy most of the frame and are centrally positioned.

Shooting angles

Work out the best shooting angles to use for different situations.

High viewpoints are best for showing the arena as a whole and indicating

the scale and intensity of the game.

Some sports photographers use camera-mounted drones for birds-eye views. (Always ask the organisers' permission before doing this.)

Exposure compensation

Sometimes the camera's settings get you close to the exposure you want, but there are times when it's not quite right; either too light or too dark. Your camera's histogram display, which maps the tones in the scene against the sensor's recording range, can

help you check exposures. It's usually found in the Display sub-menu.

When the scene is evenly-lit, the graph should be fairly even across the base line. For dark scenes, the tonal peaks will be clustered to the left of the graph, while in light and bright scenes the tones are recorded towards the right-hand end.

Histograms where the peaks rise up along the left or right hand ends of the baseline indicate dark and light tones that won't be recorded. That's when to use your camera's exposure compensation control (often indicated by a $\pm$ icon).

Moving in the + direction increases the brightness of the picture, while the – direction makes the picture darker. In each case, the increments are subtle – only 1/3 of a stop.

If the exposure compensation control is a dial or button on the camera's body it won't necessarily reset to zero when the camera is turned off. Always check the status of this function at the start of each new shooting session.



The exposure compensation dial on this Fujifilm camera is indicated by the red arrow. (Source: Fujifilm.)



Spot metering is great for obtaining correct exposures for subjects photographed against very bright or very dark backgrounds.

Right: A low shooting angle can emphasise the athleticism in sports like Freestyle BMX, where you'll need a telephoto lens to get usable close-ups from the sidelines.

Low shooting angles make athletes look larger and more imposing. You can eliminate cluttered backgrounds by showing performers against a clear sky, use a long telephoto lens to blur the background and also dramatise jumping shots in basketball, netball, volleyball and football. Low angles are also good for recording action near the ground in football tackles and soccer.

In most cases you'll be restricted to shooting from the sidelines which can provide opportunities to photograph interactions that are integral to the sport but often unseen. Look also for interactions between players waiting for their turn to bat, coaches on the sidelines and organisers preparing half-time drinks.

Finally, remember that moving subjects can pass quickly between shady areas and sunlight, so your exposure settings should be able to change to reflect different brightness levels. In the P, A and S shooting modes, if you've set the right exposure metering pattern, this adjustment should take place automatically.

Useful links

Exposure tips

www.tinyurl.com/exposure-controls

Exposure metering

www.tinyurl.com/exposure-metering



CHAPTER 7

CAPTURING MOTION

You've settled on your equipment, understood how its focusing and exposure controls work and sorted out the locations you'll shoot from. The next step is to make some decisions about how you want to record motion for different types of sports and in different situations.

Most times your choice is between 'freezing' and 'blurring' the action. The former results in shots where the

subject is pin-sharp and captured at the peak of whatever action it's involved in. The latter approach – which is used less frequently – implies motion through blurring.

There's no magic shutter speed value; in most cases you'll need to experiment with different settings to see what works for different sports and different shooting conditions. In addition, what might appear



'Freezing' action at its peak works well for sports like netball, where the action is often very fast and important points can occur frequently during a game.



Shots like this depend on the photographer focusing on the game and anticipating when the peak of the action will occur.

to be a simple solution to the challenge facing you might, in fact, turn out to be the worst option.

While beginning photographers can be tempted to use the burst mode with continuous AF, this is no guarantee of success. Unless you're really focused on what's happening, you can fail to anticipate the trajectory of the action and trigger the shutter too soon – or too late. You also need to allow for the (usually slight) delay between when the shutter is triggered and when the camera starts taking photos – as well as the lags between one shot and the next.

These lag times are longer with entry- and mid-level cameras than you find with professional equipment but, unless you take them into account, opportunities will be lost.

Interestingly, recording motion as a blur can be just as technically challenging as freezing action. You can opt to blur the background by 'panning' the camera in sync with the athlete while using a relatively slow shutter speed to blur the background. The other alternative is to show the fast motion of part of the subject, for example by blurring the batter's hand, arm and bat as they hit a ball or the ball as it leaves the bat.



The blurred ball, shown just below the batter's arm, shows how fast it was moving when it left his bat, despite the fast (1/400 second) shutter speed that 'froze' the batter's action. (Canon EOS R3 with RF 100-400mm f/5.6-8 IS USM lens at 400mm, ISO 200 at f/10.

Shutter speed

The shutter speed is the main camera adjustment for controlling how motion is reproduced. Start with the camera in Shutter Priority (Tv/S) mode and let the camera choose the aperture. If your camera permits it (many do), set the ISO to the Auto position and adjust the sensitivity range so it uses relatively large aperture settings by default.

The ISO range you choose should be as low as possible; say, 100-400 for brightly-lit places or 800-3200 for indoor venues with

artificial lighting. Lower ISO values reduce the risk of image noise in your photos.

As a rule of thumb, to freeze action, you need a shutter speed of at least 1/500 second. Consider using your camera's electronic shutter – if it has one – when you could require very fast shutter speeds of 1/8000 second or higher. Sports involving balls and/or rapid body movements require speeds of 1/1000 second or faster when you want the subject to be pin-sharp. The same is true for swimming, diving and surfing.



This shot was taken with a 200mm lens on a full-frame camera, using the maximum aperture of f/2.8 to blur the background and focus on the subjects nearest to the camera. The shutter speed was a super-fast 1/16000 second, thanks to the camera's electronic shutter, while sensitivity was a moderately high ISO 640 for the ambient lighting.

We recommend using the single or One-shot AF setting while you're learning because it forces you to become focused on the action. Your aim should be to track the subject and trigger the shutter when the action peaks. This requires practice.

Slow shutter speeds are required when you want to record motion as a blur or when panning to capture a sharply-focused subject against a blurred background. In both cases, you must guard against camera shake.

Mounting your camera on a tripod provides the required stability by giving you only the lateral motion you want and none of the vertical motion you don't. If you're using a zoom lens, start at the wide end of the range.

Panning is used to capture motion by tracking your camera horizontally as you record a moving subject. Your aim is to have the subject in focus with the background smoothly blurred. The subject should normally be moving across your field of view;

if they're coming towards you, you won't capture the full effect.

To ensure a well-blurred background, most sports photographers use shutter speeds slower than 1/60 second for panning, although you can go as low as 1/15 second, depending on ambient light levels. If the lens is stabilised, use it to minimise shake and vibration; if the lens has a panning mode, it's well worth using.

For a good panning shot, the camera should match the speed of the subject and move as it does. Having the shutter open longer is key to getting a nice background blur. Lock the focus on the subject before you start, use continuous

or AI Servo AF and, if the camera supports subject recognition AF, use it.

Panning takes practice to master.

Be prepared to take a lot of shots where nothing is in focus. When it works, a panning shot captures dynamic motion that adds interest to your photos.

Video

Video is a great way to capture sports action because it can record the entire event from start to finish – as well as beforehand and afterwards, when contextual things can happen. Video also makes it easier to tell stories about sports and provides valuable records for performance analysis.



Panning requires you to track your camera in synchronisation with the moving subject while the exposure is captured.



This sequence of frame grabs from a 4K video clip taken with a GoPro action camera demonstrates the value of recording sports with an action camera while you're participating in them.
© Roger Brown.



Skids were inevitable on this curve in the race track, so it was simply a matter of waiting for one to occur and having the camera ready to record it.



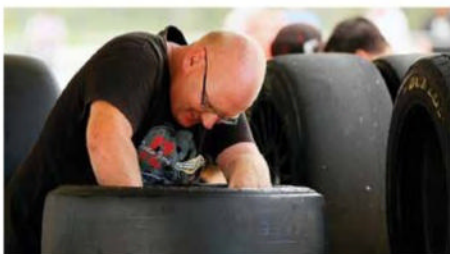
With so many cameras capable of recording 4K video, anyone involved in sports photography should also consider recording at least a few video clips, even though they may prefer to concentrate on taking stills shots. Don't dismiss footage from action cameras; sometimes you can get great shots while participating in the sport.

It's important to keep your subjects focused while you're capturing them in motion. Start by selecting the Continuous AF (AF-C) mode.

Most of the same equipment, shooting techniques and general

advice in this guide applies equally to stills shooters and videographers. And if you decide to shoot video but end up requiring one or more stills, you can extract printable still frames from 4K video recordings.

It's a straightforward process and many recently-released cameras have settings for saving selected frames as regular JPEGs. Many video players, including freeware applications like VLC Media Player and EaseUS RecExperts, allow you to pause playback and 'take a snapshot' of a selected frame. Desktop editors like



Cutaway shots like the ones shown here add context and provide a visual break from the action when you're shooting movies.

Adobe Lightroom and Premiere Pro also provide frame-grabbing facilities; as do some online editors.

Follow the lead of professional sports shooters and leave your tripod in the car, where it's accessible if you need it. Because the action at many events moves so fast, you need to be able to move about and follow the plays as well as avoid being run down by enthusiastic players or spectators.

Make sure you capture some cutaways (shots other than the sporting event itself) to use as establishing shots of the venue and to provide a visual break from the action. Good examples include fans, signs, coaches on the sideline and, of course, the scoreboard. (It's a good idea to get a shot of the scoreboard after every significant play to add context to the action.)

Finally, a couple of general tips relating to recording action with video:

1. Use the highest resolution your camera supports when you might want to extract a couple of still frames from your footage.
2. Fast action requires frame rates of at least 50 fps – so be prepared to compromise on resolution if you really want to freeze fast action.
3. If a frame rate of 25 fps is not quite fast enough to freeze the action you're shooting, scan through your footage to see if there are any frames with interesting motion blurring that could make printable stills.

4. Follow the advice of experienced sports photographer and blogger, Thom Hogan, who suggests you should ask yourself: What's likely to happen? What do I want to happen? Where do I want to be when it happens? What do I need to capture it?

5. Be prepared for the unexpected. When you're following the action closely through your camera's viewfinder, it's easy to trigger the shutter when something interesting occurs. Keep shooting while the action continues – and leave it until later to check your footage and shots to decide on the best pictures you've captured.

6. If possible, use both eyes when you're shooting; one eye to shoot, the other to help follow the action. This helps you to avoid being hit by a ball, bumped by another spectator or run down by a sprinting athlete.

7. If you lose the play in the eyepiece, zoom out to wide-angle until you find the play, then zoom back in. You can also use the zoom to keep players the same size throughout the video.

8. Practice. The more you shoot, the better you'll become.

Useful links

Moving subject shooting tips
www.tinyurl.com/moving-subjects

Ella Ling tennis photography
<https://tinyurl.com/ella-ling-pro>

CHAPTER 8

DRIVE MODE CHOICES

Most cameras these days have selectable drive modes with single-shot plus fast and slow (or ‘high’ or ‘low’ speed) continuous settings. Some include bracketing; others add multi-shot or HDR (high dynamic range). More recent models may take in pre-capture recording and a few combine the video settings with the drive menu.

Continuous shooting

How much you rely on your camera’s burst capture settings is a personal choice. Some photographers prefer a ‘hunting’ style approach that aims to ‘nail’ the peak of the action with a single exposure, while others favour a ‘spray and pray’ tack, hoping to be able to find at least one frame in the sequence that’s what they wanted.

The basic purpose of the continuous shooting mode is to make your camera continue to capture frames as long as you hold the shutter release down. How long the burst can continue is limited by the size of the image files, the capacity of the camera’s buffer memory and whether there’s enough power in the battery to allow the shutter to be re-activated.



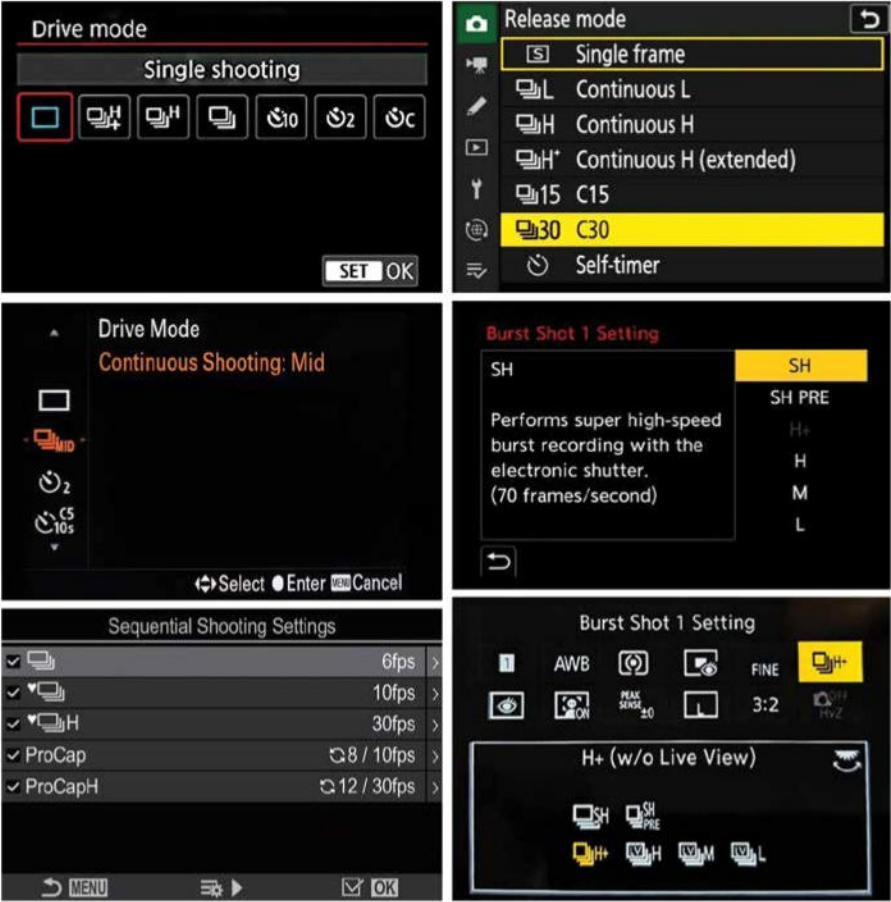
*This Panasonic interchangeable-lens camera has the Movie setting on its exposure mode dial plus a separate dial for setting the drive modes.
(Source: Panasonic.)*

Buffer capacities can be limited by the camera’s resolution and what file format you use. They are always greater for JPEG and HEIF files (which are always compressed) than raw (RAW) files, which capture more data, regardless of whether they are losslessly compressed or uncompressed. Chapter 2 has details of the different file formats, while Chapter 3 contains more information on the need for speed.

Typical frame rates for the high-speed setting range upwards from about 10 fps with the mechanical shutter or go as high as 30 fps when the electronic



A burst sequence recorded by a compact camera with a zoom lens and a maximum frame rate of 5 fps, which wasn't quite fast enough to keep up with the action. Use of a wide lens aperture on a fairly slow telephoto zoom lens added to the focusing difficulties.



Drive menu settings from six different cameras show typical settings available. Many cameras include self-timer and bracketing settings in their drive menus and some, such as the bottom left page, add pre-release capture.

shutter is used. The low-speed setting may only record at 3-5 fps – and occasionally even less.

It's easy to be seduced by claims of fast continuous shooting rates, but continuous shooting has positive and negative aspects. Unless you want to capture a sequence of shots covering a specific action, such as a golf swing, jumping a hurdle or a goal shot in basketball, you're more likely to obtain more sharp shots with the single-frame mode.

Some cameras lock focus and exposure for the first shot in a burst. This can result in a loss of focus when the subject moves out of the sharply-focused zone – or exposure variations when the lighting changes during the burst (which can occur if the subject moves in or out of shadow or the angle of view changes between high and low during the burst).

Where a camera can adjust focus with each frame for moving subjects it's usually not at the camera's maximum possible frame rate. This can mean there's insufficient time for the camera to focus between shots and you'll end up with near misses.

Even though cameras with the latest image processors and fast, high-capacity memory cards are capable of supporting extended bursts at fast capture rates, in general an experienced photographer gets better shots if they avoid the burst mode for situations where the action peaks in a split second, such as at the top of a jump or dive or the finish of a race.

It's also wise to keep bursts short to ensure the images move quickly to the memory card freeing the camera to shoot again. Bursts of three to five frames are often long enough to cover the peak of an action and allow you to pause a second then shoot another burst.

Older and entry-level cameras can take as long as 30 seconds to process a 10-second burst at a high frame rate – and some take even longer.

Some burst modes can't be used in conjunction with flash and zoom and some require shutter speeds of 1/30 second or faster. Check your camera's instruction manual to find its limitations.

Bracketing

Bracketing sets the camera to record a sequence of frames while varying one exposure parameter. Basically, it records the same shot at several different settings. Exposure is the most common, with most cameras supporting Auto Exposure Bracketing (AEB).

You can normally set the camera to capture between 3 and 7 frames with exposures changing in 1/3 or half-stop increments on each side of the zero (metered exposure point). Many cameras let you select other functions to bracket, most commonly white balance, focus, flash level or ISO sensitivity. Some offer bracketing for effects filters.

Pre-release capture

This selectable recording mode uses the camera's continuous shooting capabilities but activates as soon as the shutter button is half-pressed. This makes the camera start recording images into a temporary memory buffer.

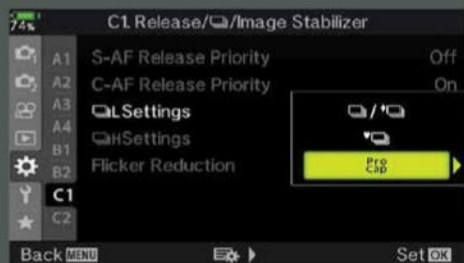
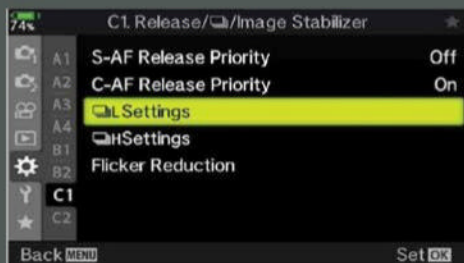
When the shutter button is fully pressed, these images will be saved. In most cameras with this feature, up to one second of frames captured before the shutter is pressed will be saved, along with the subsequent burst of shots.

In some cameras, the pre-release capture function uses the image sensor in a video mode, where the bandwidth and rolling shutter attributes are different from the regular burst shooting mode. This can cause a slight pause in image capture as the camera switches between these modes and you could expect to miss a few frames at the point where the shutter is released.

In most cameras, this feature is restricted to JPEG files but, even so it's really useful for sports photographers – and also for those who photograph birds in flight – because it lets them capture fast-changing or unpredictable moments. Look for settings such as Pre-continuous shooting (Canon), Pre-shot (Fujifilm), Pre-release capture (Nikon), Pro Capture (OM System), Pre-capture (Sony) or Pre-Burst (Panasonic).

The buffer rate will depend on the continuous shooting mode setting you choose (e.g., 30, 60, or 120 frames per second). Many cameras also let you configure how long to take shots after you press the shutter fully; with a typical range from one to about four seconds.

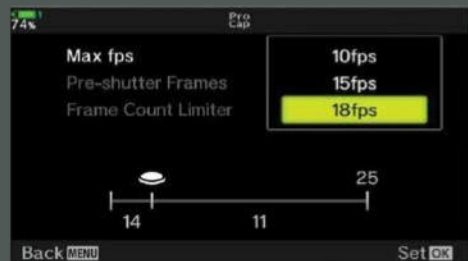
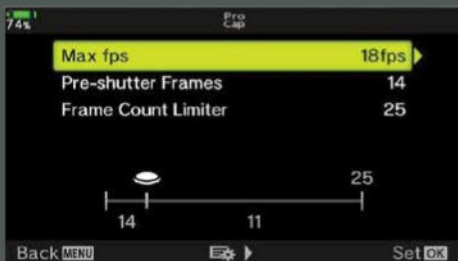
Being a relatively new shooting mode, pre-release capture is one area where we can expect further developments to occur. Watch for any firmware updates for your camera, particularly if it's a recent release.



Pages from the Pro Capture menu in OM System cameras show how to engage the mode and the options available.



Panasonic's pre-burst function uses the image sensor in video mode and allows photographers to record 30 frames when the shutter button is half pressed and up to 30 frames after it has been pressed all the way down. (Source: Panasonic.)





When subjects can move unpredictably and you want to make sure you obtain at least one sharp image, it's better to take a few shots in single-shot mode since burst capture can be unreliable at low frame rates.

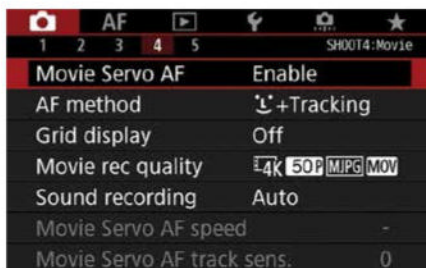
AE bracketing can be useful for sports photography, providing frame rates are fast enough to freeze the action. In tricky lighting conditions it can give you a range of options to choose from when you're editing so you're less likely to end up with a poorly-exposed shot.

It can also give you exposure variations to blend to capture detail in highlights and shadows.

Video

Capturing sports action with video gives you the opportunity to show your audience the full extent of the action. Video can be more engaging for audiences than stills since it records constantly-changing motion.

However, you need to master certain technical settings and shooting techniques to manage the fast pace of the game. You also need to maintain camera stability while recording the action and use the appropriate frame rate for what you want to record.



A menu page showing typical camera settings for shooting video.

You may also find it necessary to shoot in manual mode to maintain complete control over your exposure and focus settings, since automatic modes may adjust settings too slowly to keep up with the rapidly changing light and movement on the field. Unfortunately, some cameras only record video in an automatic mode, so you need to find work-arounds to avoid exposure and focusing errors.

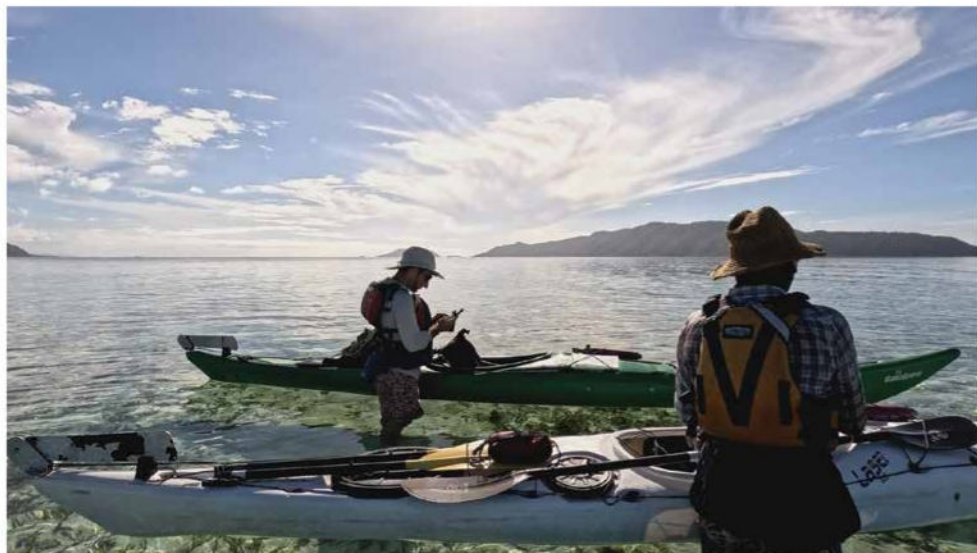
High frame rates are required to capture fast motion and allow for smooth slow-motion playback in editing, so you need a camera that can record at 50 or 60 frames per second (fps) as well as the standard 25fps or 30fps. Higher frame rates of 100fps or 120fps are required for cinematic slow-motion playback.

Use the lens aperture to control depth of field, typically shooting between f/4 and f/8 to keep the action in acceptable focus. For shutter speeds, a useful rule-of-thumb is to keep them around double the frame rate. Auto ISO mode usually delivers good exposures – provided you've set an upper level that doesn't introduce excessive noise.

Make use of any image stabilisation available, noting that video-specific IS modes usually crop the image frame. If your camera lacks IS mount it on a sturdy tripod or monopod with a fluid head to enable smooth panning. Set the focus to continuous AF and try to use your zoom lens to keep players a consistent size within the frame.



Shooting video is a great way for you to capture a sequence of actions. © Roger Brown.



Record a variety of shots in addition to the main action so you can add interest when you're assembling the footage to create the final movie. And don't forget you can capture printable stills by 'grabbing' frames from your footage when editing it. A 4K frame can produce 3840 x 2160 pixel images that can be printed at A3 size with the standard 300 dpi resolution used for regular printing.

Useful links

Action shooting tips

www.tinyurl.com/action-photo-tips

World Sports Photography

Awards winners

www.tinyurl.com/world-sports-photo-winners



Scenes of jubilation following a grade cricket Grand Final victory. Note how the photographer has gradually zoomed in on the scene.

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- Why the speed of your equipment has a major impact on action shots
- How careful preparation and planning create more shooting opportunities
- The essential principles of focus and exposure control
- When to freeze movement and when to embrace motion blur
- How effective drive mode choices can improve your results

A practical, fully illustrated guide for capturing the speed, skill, and drama of sport.

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\$24.99 inc. gst

ISBN 978-1-922156-68-6



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