

A Video Analysis Primer for Swim Coaches

By Robert H. Boder

Here are the steps I took to incorporate video analysis into my YMCA competitive swimming programs in 2006. It explains briefly:

- Equipment needed for video analysis
- Organizational details and “best practices” of clinics and camps I have participated in
- Results of my programs
- Thoughts and tips learned from other coaches and the hard way.

Video analysis is now an important part of many clinic and camp programs. It is affordable for any size team or individual. If you are a part time coach of a Masters, recreational or YMCA team, this information may help, you decide to acquire and use video analysis in your programs.

Any individual with swimmers in the family and a camera could use this material. Once you read and see what the experts say to do, it is easy to compare their thoughts with your swimmer’s actions. Good coaches do not see any more than we do. They pick up the faults faster and know how to get swimmers to change. Anyone can improve his or her coaching skills in these areas with practice.

A key to stroke improvement for swimmers is to see what they do instead of thinking what they do. After seeing, they are motivated to change. The coach goes from seller of change to facilitator.

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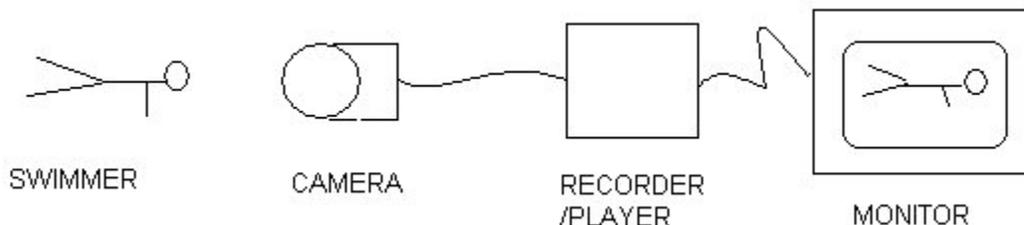
A Little History

As Aquatic Director and swim team coach at the Charles River YMCA in Needham Massachusetts, I have the means and mission to carry out the programs in this article. My goal is to improve the quality and reputation of our swimming offerings. Running successful competitive swimming programs is a great way to help reach that goal. The swim team’s success and hosting clinics for Masters down to age group swimmers demonstrates our commitment to delivering a quality product in lesson and competitive programs.

My swim team parents asked me what I wanted for Christmas in 2005. My first reply was an expensive new book on how to coach. They said they wanted to give me something bigger. Then I replied, "I would like an underwater video camera". Santa delivered. This is the story of selecting a system and learning to use it.

Video Technology

This is a quick introduction to the various components needed to record, replay and analyze a swimmer's stroke. I will mention specific products I use or know of. There are alternatives to these. Just use an Internet search engine or visit an electronics store.



You need the three pieces of equipment above and a swimmer to do video analysis.

- For **cameras**, there are two choices. First, there are VHS or DVD camera recorders. Some of these have an underwater case that allows you to sit on the bottom of the pool and play camera operator. Otherwise, you buy a color circuit-board video camera in a waterproof housing. AQUACAM is the product name of my circuit board camera. The camera provides input to a video recorder. Other vendors include Snooper Systems from D'Zign Technologies, Sea View SM-50 from Water Fitness Store, CoachCam from Underwater Camera Company of America and Splash-Cam from Ocean Systems. All these systems are similar in design, options and price. Poseidon Technologies has a lifeguard video safety system for pools used by swim teams.
- **Video recorders** take video input from either an internal or an external camera to record to VHS, DVD or store the images on a digital medium. Removable recording media is either VHS tape or DVD disks. VHS devices are a dated technology. The tapes hold many minutes of video and are reusable. DVD is newer and has a number of advantages over tape. A digital video recorder (DVR) records video to an internal digital storage medium. The term includes stand-alone set-top boxes and PC software. TVIO is a special type of DVR tied to a commercial input signal. TVIO devices may not work with a non-commercial signal. A DVR has all the advantages of a DVD player plus the ability to record more information. It allows playbacks to a monitor while recording additional information.
- **Viewing monitors** take input from recorders or cameras. The monitor should be of a size that allows everyone viewing the video to see the details. Monitor price and weight increase with screen size. A monitor is simply a TV with input ports for video games. Many monitors have build in VCR or DVD players. The one I use has a VCR player/recorder.
- **Editing tools** are available on some recorders and computers. They allow the removal of "dead time" or goofs prior to finalizing the video. From the finalized video, you can produce individual CDs or DVDs for your swimmers. Use the images in technical articles if you aspire to be a writer. When purchasing a DVD recorder this software should be included. The cameras attach via a fire wire or USB port. I use the software that came with my HANDYCAM. Dartfish software for video analysis from Dartfish USA does complex video analysis for sports. It is an example of a commercially available product.

Attaching all these devices to each other is easy. The ports and camera RCA cable plugs are all color-coded. There are only three wires. Specialized interfaces on recorders and PCs have unique attachment cable plugs and ports for each interface.

Preparation

A camp or clinic is a full season of stroke training compressed into a short time period. The principles for success are the same. I wanted to understand and apply these principles to my program. Two years ago, I started hosting clinics at my pool and serving in summer swim camps as an instructor. My goals were simple: learn how to be a better coach and have my swimmers learn from the experts. These experiences allowed me to understand how to organize instruction and improve my stroke analysis skills. I became a better coach and gained the technical knowledge to start my own program.

Concurrent with these activities I produced a series of thirty minute TV shows, Swimming Rules, for Needham's public access television station, The Needham Channel. Public access television is a great local resource to learn how to make videos and get technical support. Stations operate on cable networks throughout the United States showing locally produced programs. They air programming from other stations when requested by residents. I have community exposure for my YMCA programs. One show is on competitive swimming techniques and rules. The station schedules it when swim teams are active. The water safety show goes on in the spring. Appendix C details on how to purchase or arrange an exchange to air the shows on your local station.

Where and What I Learned

My first clinic experience was hosting Karlyn Pipes-Neilsen and her husband Eric's Fabulous Freestyle Clinic for Master's swimmers. They run this clinic at sites throughout the country. The New England Masters put me in touch with them. This experience got me hooked on the value of clinics. Next came a week as a lane coach at a North Shore YMCA in Beverly, Massachusetts Summer Swim Camp where I met Paul Bennett, the WPI college coach. I hosted two clinics with Paul for my age group and high school swim teams last October. Karlyn and Eric came back again this spring. This summer I was a lane coach at the Technique Swim Camp.

The clinics were single four-hour sessions. The North Shore YMCA Camp and Technique Swim Camp (sometimes called the Harvard Swim Camp) where I served under Northeastern University head coach Roy Coates do day sessions in their one week camps. These sessions are similar to the clinics in organization. The time spent shooting video varied in the programs.

The instruction portions of the clinics and camp sessions have five parts. They are:

- out of the water stroke overview
- in the water swimming and shooting video
- out of the water video critique and lecture
- in the water practicing corrections
- a wrap-up video swim and critique

All start with the lead coach providing instruction. Some show a video of a famous swimmer doing the session stroke. Next is swimming and camera work. The most important part is analysis of the individual swimmers. Analysis takes time so it overlaps with pool time and instruction by lane coaches. Swimmers are in groups to reduce wait time. For the day camps, there will be a lecture segment on such topics as goal setting or national level swimming experience. The shorter clinics will do a brief training, motivation or nutrition presentation. Next lane coaches conduct pool instruction and drills. This is everyday coaching. The lane coaches must have experience working with the age groups in the clinic and teaching the techniques the lead coach is using. The parts may not be in this order and some programs do not do a video wrap-up.

To the right is Roy Coates doing the technical analysis for swimmers at a Technique Swim Camp. The monitor connects to a DVR device. The DVR stores images from a circuit board camera mounted underwater in a lane. While Roy is doing the replay analysis for one group, others are swimming and being recorded on the DVR. The lane coach takes notes on the specific stroke corrections for each swimmer. When the swimmers return to their practice lane, instruction will start to focus on correcting specific needs. Northeastern has a wide pool deck with bleachers on both sides. There is no need to leave the deck to watch the videos.



The Neilsen clinics start with a combination lecture and in the water demonstration by Karlyn. The objective is to change attendee's stroke to her method of swimming. Swimmers do a series of drills and full stroke swims to implement this stroke. They shoot a video during the first instructional swim. Half the swimmers leave the water for analysis and lecture. The others continue to swim. Then the second group goes for analysis and lecture. First group comes back and swims. When everyone is back in the pool, there is individual stroke correction and another video. The session ends with a final analysis, lecture and a period of questions and answers.

Clinics with Paul Bennett were different. The two clinics each covered all four strokes in four hours. The first was for younger age group swimmers. The second was for high school swimmers. The clinics had one object, get an outstanding college coach to analyze our swimmers needs. At the high school session, the Needham Channel shot a segment for the station's sports show. With the TV camera, we shot swimmers swimming towards our camera. Paul's monitor showing their underwater stroke was visible on the right side of the screen. What a sequence! We captured both the underwater and surface images side by side. Paul had both the underwater and surface images on separate DVDs. He used these for his analysis. I am now working on directing the underwater camera to a monitor capturing the session on a VHS tape. I will use my DVD camera to do both the surface filming of the swimmer and the underwater monitor. Now I will have a digital capturing of both the surface and underwater action and can view these frame by frame. When done, I will be able to determine if I have enough image resolution to do effective analysis. I am getting ahead of myself.

Best Practices

The four hour "out of town expert" clinic by Karlyn and Eric is a great model for this type of event. They teach a very specific freestyle method, [front quadrant technique](#) with a wide entry. There is no wasted time during the session. All the demonstrations, explanations and drills are on message. They provide appropriate handouts and have Karlyn's Go.Swim DVD available for attendees to buy.

Here is Eric Neilsen doing stroke analysis for one group of swimmers at a Charles River YMCA clinic. The video input is from a Sony VHS HANDYCAM into a 25-inch TV monitor. There are before and after video segments during these clinics. Attendees are split into groups so much of the in water instruction and video analysis is overlapped. Attendance is limited to the number of swimmers that can be served in the clinic time.



The Technique Swim Camps have a very effective daily program for individual strokes. The week I taught there were 24 swimmers. We had four lanes for swimming. Two lanes were for underwater video filming and analysis. In both lanes were DVR recorders. Video capture and analysis went on concurrently. Roy Coates, the lead coach and Bob Tyler, Milton Academy coach, did the morning analysis. There were four lanes for instruction. Each lane had a coach. Lane coaches worked with the attendees. First doing drills then swims to build correct stroke technique. Then swimmers move to the

video lane to identify specific faults for work until the noon break. In the afternoons, lane coaches continue instruction and once again film the swimmers. They do another critique analysis. Having so much capacity to film and critique simultaneously was a real aid to the lane coaches. We repeated swims to insure swimmers understand and execute corrections.

They also have their underwater camera configured to mount on a weighted board on the pool bottom. This is much better than the pole for applications like their camp program or when using DVR recorders. We used my pole mounted underwater camera in the second lane. The Technique camp at Harvard University uses a TVIO recorder for both the camp and the college teams.

The North Shore YMCA camp's practice of providing swimmers with a DVD showing swims with audio comments is great. Brian Cameron spends considerable time generating these DVDs. He uploads the captured video to a PC then edits and creates individual mini DVDs from the data. Swimmers can review what to work on. The North Shore YMCA has a large and very successful USA and YMCA team. Without access to a computer media expert or plenty of time, this practice may be more than a small recreational team can manage.

The Nielsen's clinic and the Technique Camp shoot both before and after swims for each swimmer. This part of the program must run quickly. Make sure to identify each swimmer in the water. Technique camps use caps with names on them. Karlyn numbers each swimmer on the shoulder. I have a "20 swimmers for 4 hours rule in four lanes" rule to project clinic capacity. It accounts for the time to video record and analyze each swimmer. The first rule in video production is "don't underestimate the shooting time!" For Masters the swimming time is less but the critique takes longer. The reverse is true for children. Try not to have more than eight preteens at a time watching the videos. They quickly lose interest. The next factor to consider is the number of swimmers a lane coach can work with. The YMCA limit for competitive swimmers is eight per lane. The number is too high for adults and accomplished high school swimmers. They need more room to swim. My pool has four narrow lanes. With a larger pool and individual lane coaches, the number of swimmers may be higher.

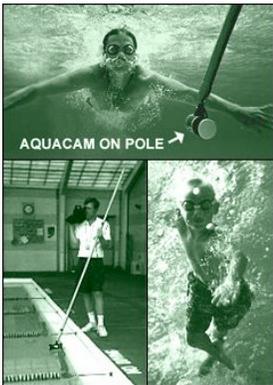
All the clinics except for the Neilsens' have at least one coach per lane. The Neilsens' had three on deck for the primary instructional period and two while half the class was watching their videos. I spent two days swimming with Karlyn before the first clinic. She taught me her method of swimming and was the third coach. My experiences at the two swim camps were similar. Each camp had a lane coach for every eight to ten swimmers. The North Shore YMCA camp had over 30 swimmers. It used six or more of eight lanes. Each lane coach had one or two assistants. The assistants were outstanding high school or college swimmers and current or former members of the YMCA's team. They knew most of the attendees and served in previous camps. The Technique's lane coaches were experienced in that program as well and included Julie Norton, the Northeastern assistant coach. Both camps have "guest" lane coaches. As a guest, I learned from and shared my experiences with the regular staff. It was nice to give the other coaches the opportunity to see and evaluate my favorite drills and teaching techniques.

Charles River YMCA Video Programs

The YMCA swim team's parents donated an underwater camera and video recorder to the team, "my Christmas present". The clinics I ran plus encouraging them to send their children to local swim camps made this an easy investment for them to make in our program. Effective use of this generous gift will improve our team's competitive results and add to the YMCA's image of being committed to quality swimming programs.

I selected the underwater camera and DVD recorder package from AQUACAM in New Hampshire, swimcoaching.com/newaquacamhome.htm. This gave me one stop shopping and technical support from close to home. A DVD recorder is more expensive than VHS but has a number of

advantages that I wanted. The most important feature to me was the ability to edit and create DVDs on my home computer. A DVD recorder with computer uploading is a little more complex than working with VHS tape. You also need some computer knowledge to install, learn and use the computer software to take maximum advantage of what you have bought. My Sony HANDYCAM came with software to load and edit the video material. Appendix A has my first efforts to use the Sony software. Microsoft Media Player, which came with my computer, plays the result. The two images of key points in the butterfly stroke cycle came from the video. There are three DVD formats available. They are priced by the features they support. The least expensive is DVD-R. This you can write only once. It is the media to use when making copies for distribution. The next format is DVD-RW. This is like having a VHS tape. It is reusable and of course, the contents are transferable to a PC. The most flexible format, DVD+RW, is not worth buying.



The underwater camera selection is the easy part. As mentioned before AQUACAM is one of a number of companies offering cameras. The AQUACAM attachment to the camera allows placing the camera at the end of a pole so it is portable. Cameras use rechargeable batteries. For long sessions have extra batteries and to attend to recharging duties. A pluggable power source would be better especially when feeding images to a DVR. The camera plugs into any television monitor that will take videogame input. After my son broke his TV's antenna connection, I rescued it and added it to my video tool collection. It has a built-in VCR. The camera provides only video input. The audio port may work with a hand held microphone. This is another test to do. Now I can record from the camera with DVDs or VHS tapes.

Since acquiring this equipment, I have been slowly introducing video analysis into classes. First, I used the combination of my HANDYCAM taking input from the underwater camera in a class for adult triathlon swimmers. Next, I shot swims with the HANDYCAM from the pool deck. In the following class, we reviewed the output by plugging the HANDYCAM, acting as a DVD player, into the rescued TV. Swims by my son and I were added to the DVD. Finally came uploading to my PC the unedited images to make a movie. The results are in Appendix A. Next, I did a session with two nationally ranked synchronized swimmers. They are using the DVD to perfect their routines for national competition. I am currently doing a series of clinics composed of five daily one-hour classes. In these clinics, I capture the underwater video on VHS using the TV/VCR. The DVD HANDYCAM is only for surface filming. My goal is to have simultaneous surface and under water coverage of a swim. This reduces the time to record swims and allows for more instruction.

The Results to Date

My time spent learning from the experts was a great investment. I allowed the proper amounts of time for both shooting video and doing the analysis in my classes. A Masters swimmer now swims repeat 100s ten seconds faster after seeing a major flaw in his underwater pull. With both my age group and adult swimmers, I could see some immediate improvement in very basic techniques such as body position and pull patterns. Complex movement patterns do not lend themselves to easy correction. The good news is the attempts at improvement in this area were evident at all levels.

On the negative side, I am a bad cinematographer and disregarded all I learned from Marc Mandel, Executive Director of the Needham Channel, while making my TV programs. Professional level camera work adds quality to the images. Poor camera work is a distraction to students. It wastes time. The students to lose focus. I was all over the place. Here is a list of what to do:

- Anchor the underwater camera securely. Do not allow it to move. Sight it in and secure it before the actual filming. My efforts to move the camera were not successful. I could not keep the camera level. The result was like watching a TV where someone is tilting it from side to side.

- Use a tripod for surface filming. Again, sight in the camera and leave it. Tilt the camera forward as the swimmer moves down the lane. Avoid climbing on and off the starting blocks. It wastes film and the camera cannot swim.
- Do not try to cover more than one lane. Sight in the cameras and do not expect to get more than about 10 yards of good images. Remember you need only one complete stroke cycle. If you try to zoom in and out, switch too often between swimmers or switch between wide angle and tight shots the video will be very choppy and distracting. Younger students quickly lose focus if the occurs when watching.

In spite of bad camera work, I had at least one good stroke cycle of every swimmer to do an effective stroke analysis. This is because of the stop and slow motion capabilities of a recorder/player. Moving the video image to a computer gives even more options to improve the analytical process. You will see this by watching the short video in Appendix A. The appendix's still shots from the video point out specific flaws in my stroke.

The use of VHS underwater capture for my age group clinics was a good idea on a number of levels. It allowed me to collect a great deal of film on the TV's VCR. For young children you will be able to correct only one or two faults in a session. Therefore, I collected what I needed to impart age appropriate recommendations. This also demonstrates the flexibility of the underwater cameras to feed a variety of devices. Thanks to my son, I can collect above and below images simultaneously. I used the DVD camera to collect surface images. The time to collect data was short. I needed that to cover all bases in an hour session. The surface DVD is where I needed the remote control of the slow motion and stop functions to point out flaws in body alignment, hand entry, pull patterns and kicking. The HANDYCAM has a remote controller.

Technique camp video was from underwater cameras. The North Shore YMCA used a surface camera. Either can be very effective. Having both is best. It minimizes filming and allows a more complete analysis. You can never have too much information.

Thoughts on How to Do a Video Session the Right Way

Preparation is necessary. There is a great deal of down time for the swimmers without organized and parallel activities. These include filming in one lane, instructional swimming in other lanes or dry land instruction. When doing surface video capture there should not be too much noise. The recorder allows audio comments while filming.

Again, lane coaches must teach the same techniques as the head coach. For a Masters program or a recreational team, consider this when staffing. I use teenagers who have been working with me for a long time. They know the children from the YMCA team and the town's programs. Teenagers communicate well with the younger children. They are very good at one on one instruction. The head coach must be on deck to oversee instruction and make sure the individual instruction is correct. This way the coach is improving the skills of both the instructors and students.

Training sessions dedicated to stroke correction need in the water drills. You cannot learn to swim on dry land or watching a movie. The bad habits of swimmers are usually well established. I explain why to change on a conceptual basis in simple terms. Next, explain or have a lane coach demonstrate the correct movements. Once students know and accept the theory understanding how to execute is easier. Do short distance swims and break the practice portion into parts of one hour or less. This gives everyone a rest from both the work and concentration. The break allows you to see which corrections are remembered when they return to the water. Try a fast swim in the opening part of the second water session to point out forgotten changes. All clinics and camps use this method. The second session repeats the first but reduces the number of drills and adds full stroke swims. Throw in late arrivals, bathroom breaks and movement to and from dry land activities. Hours pass very quickly.

Four hours are the minimum amount of time to spend on a single stroke. In the WPI clinics where we did four strokes, the objective was different. Paul Bennett is a very successful and experienced coach. Few of the children on my team and the high school team had previous exposure to such good coaching. For the younger children it was the first time they were part of a clinic/camp experience. Many had never been on a swim team before. We were looking to give them a good conceptual foundation and correcting one or two major problems. Parents also attended the critiques so they were educated. The high school clinic with underwater video was to find and correct the one or two errors that only a highly qualified coach such as Paul could identify and correct. The clinics were very successful. When trying to improve the swimming culture of a community, exposure to superior coaching is necessary. People will invest in what they believe in. Children will participate in the sports that offer the best coaching and opportunities for success. The sport should be swimming!

Try to have groups with swimmers of equal ability and age. Adults and advanced teenagers can absorb much more information than preteens. For preteens, dispensing too much information will be like having them drink from a fire hose. Limit the commenting on to only one or two points per swim. Make positive comments. They do not count as analyzing points. The critiques are to encourage and not to scold.

There must be follow up. A spring clinic for a swimmer who will not see the water again for two months is a waste of time in terms of stroke improvement. Detached clinic attendance can be valuable on a conceptual level if it is introducing new concepts or training techniques. Swimmers should come away from these with some written information to study or a video of the material. Many swimmers at clinics I have attended quickly revert to old habits if not watched closely. Watching your swim movie moment is only a nice wakeup call. The video stroke analysis becomes a long-term program by both the coach and swimmer to be effective. Video analysis is a costly tool to use in terms of time. Do not use it too often. Stroke changes need time to become rote. It takes more than simply completing a clinic or camp. Incorporating my new tools and knowledge into the upcoming winter season will be a key challenge. I have to do more than one video session without compromising the time for on deck demonstrations and regular workouts.

If you plan to show commercial videos by top coaches or swimmers to age group swimmers use material with current superstars. The kids do not know any one from more than one Olympics ago. They want to see the stars they know.

Find free education to improve your coaching skills. Hosting clinics or being a lane coach for a week at a swim camp is a way to do this. It is also a great way to meet people with the same professional interests. I like and learned from everyone I met. Consider this a benefit that goes with the job. We work in a very friendly sports community.

Create the opportunity to have a college coach and team members come in to do a clinic for age group swimmers. The younger kids really enjoy instruction by such good swimmers. High school swimmers quickly see that these college swimmers are not that much better than they are. They realize that they will be able to swim in college as well. Everyone benefits. Paul Bennett's WPI team uses their fee to help finance a Christmas training trip. It gives college coaches exposure in communities where they would like to recruit. Posting at your site the fact that you are running clinics with this caliber of instructors will reflect well on your entire program. Lesson parents visualize their children participating in a few years.

Understand the video filming laws of your state or country. You cannot film and use the material without consent especially where children are involved. I believe if the published write up of a program

you are running clearly states that video is for instructional purposes you do not need explicit consent. This is implied consent. You can only use these videos in the context of the program. You should check this point with a lawyer. In my movie in the appendix, I only use images of family members. The same goes for written articles get the proper permissions before you publish.

I have not mentioned simply using a digital camera with a large memory capacity to do the data capture. Because of the need to upload the pictures this would not work in a clinic setting. It would provide a great series of pictures to critique from or use in an article. My son uses this technique to make short and very interesting videos of skateboarders. This is not a resource that to be overlooked when doing video capture. Envision a line of parents on the pool deck with cameras in hand waiting for their children to swim. Let the show begin!

It is also a great tool for a stroke coach to use during a practice. Just shoot a quick stroke sequence and show it immediately to the swimmer at practice. Print it later or just delete it.

I Have Left the Best Advice for Last.

How do you learn to analyze someone's stroke from a video? It is the same as watching from the pool deck with an instant replay button in hand. There is no magic in this process.

- Know what is right and how to describe it.
- Watch the same video repeatedly.
- Become adept at using the remote control stop, start, slow motion and rewind buttons.
- Know what you want to see and how to look for it.
- Have good camera work.
- See the stroke from different angles.

Soon you will think about winning an Oscar. Just like watching a great movie, do not expect to see all the details the first time. Try to work in from major flaws to minor ones. Fix body position, pull patterns, rotations, undulations, kicks and on down the list. Make a check order list and follow it. Know your audience. The critique needs to be in terms they understand. With high school and older swimmers be prepared for objections and have standard phrases to handle them. "Yes there are other styles of breaststroke" or "Discuss what you have seen with your regular coach". Have fun and enjoy the work.

How do you decide to run a camp or clinic? You do not! Your facility space availability, pool schedule and business objectives do. They control the resources. Clinics and camps need space for dry land activities. Without this, options are limited. Pool schedules dictate when swims will be available. An all day camp requires at least four hours of pool time between 9 am to 4 pm. Call your program a camp and you have a whole host of state regulations to implement. Camps are serious business. This leaves clinics as the only option unless you are a school, YMCA or other organization with the resources to be in the camping business.

There are two options for clinics. "Out of town expert" run or do it yourself. Clinics are nice revenue generators when done correctly. They are also a good way to sell your programs to prospective swimmers. The pool schedule once again plays a dominate role. The best time to run a clinic for adults is weekday evenings or on a Saturday. These are whole pool events for anything smaller than a fifty-meter pool. For children weekend days are best.

Have a plan that covers the three factors. For example, I can make a business case to run week clinics of one or two hour sessions at my site in the summers. This is because my YMCA will not use the pool for afternoon camp swims. My vision is to attract swimmers from the surrounding town and club teams. These teams have over 150 swimmers. They practice in the mornings. I have unused pool time during summer afternoons. I know many of the summer teams' families. It is easy to announce a program in the town for these teams. I want to do four camps and expect at least ten or more swimmers in each. I have to pay two staff members as assistants. My price will be \$80 per swimmer. I can compare that price to other programs in the area. It is a marketing and revenue opportunity.

Again this year I will look for “out of town expert” opportunities. These are not gold mines. Do not expect to get many USA team or large Masters practice group swimmers. Do expect that good high school, recreational or seasonal team swimmers will attend one clinic a year. “Out of town” experts may draw less repeat business each year in areas with small swimming populations. Try to find them other opportunities near by. They are spreading new ideas and need our help. “Out of town experts” have minimum fees so the events are not always profitable in dollars. They are long on visibility for your program and that is important. I view clinics as a service to the community. When swimming is a popular and successful sport in the area, I get my share of swimmers.

As coaches, we all have much to learn about using video analysis at practices. There is so much technology available at an affordable price even the smallest programs can use it. A picture can save a thousand words. You do not have to worry about the words being misunderstood or not coming out the way you wanted. Video will be an important part of our coaching future.

Acknowledgements

I have mentioned a number of individuals and a company whose product I use. I want to thank the individuals for all they taught me and for taking time to review this material. They have also kindly given me permission to use the pictures included in this article

AQUACAM at P.O. Box 852 Portsmouth, N.H. 03801 toll free: 1-800-SWIM888 Fax: 207-451-9286 International: 207-439-5458 sells packaged solutions with circuit board cameras and a video recorder or a digital video recorder. Greg Cronauer is the contact and is eager to explain his product and how to use it. The Aquacam picture is used with his permission.

Karlyn Pipes-Neilsen and Eric Neilsen at www.aquaticedge.org web site. 77-6479 Kilohana St, Kailua-Kona, Hawaii 96740 (808) 331-1766 aquaticedge at hawaii.rr.com is the email address. The picture of Eric Neilsen is used with his permission.

Technique Swim Camp info at techswimcamp.com. Tel - (617) 484-0550 holds swim camps at Harvard and Northeastern Universities in Boston Massachusetts, Fax - (617) 507-4697, Harvard Head Coaches Tim Murphy and Stephanie Morawski, and Northeastern Head Coach Roy Coates are on deck daily and provide underwater stroke critique during the morning video sessions. The picture of Roy Coates is used with the permission of the Technique Swim Camp.

Paul Bennett Head Coach, WPI Swimming & Diving and Director of Aquatics 1-508-831-5625 pbennett at wpi.edu

Brian Cameron Head Coach, North Shore Sharks at the YMCA of the North Shore Beverly, Massachusetts. At 1-978-927-6855 x 136. The North Shore Sharks are one of New England's most successful YMCA teams.

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About the author



Robert Boder is the Aquatics Director for Competitive Programs at the Charles River YMCA in Needham, Massachusetts. As a Masters swimmer, he has achieved USA national top ten finishes in a number of events and numerous New England Masters Top Ten finishes in three age groups. ***Training Alone During Your Pool's Lap Swim*** on the US Masters Swimming web site and ***Elbows high. How it really works for front quadrant freestyle technique*** on the www.swimnews.ch web site are two other articles he has written. His winter season only YMCA swim team has produced successful swimmers at both the district and regional levels. His email address is rboder (at) Comcast.net.

Appendix A Sample Video

This is my first attempt at movie making from a HANDYCAM DVD file. It will not win any prizes and is very short. After viewing it, you will be able to give me a good stroke critique. Click on the blue screen and the video will play. You can control the playing as if it was a DVD.



© Robert Boder

This video and the below images may only be used within the context of this article.

Below is a frame from the above video. You can now do your own analysis of what is wrong with my stroke at this point. Ideally, I would have better form and this would show my chin coming forward. I would not be coming so high out of the water. As I have completed taking a breath my face will be in the water as the arms continue forward for the recovery.



© Robert Boder

This is the frame of my arms entering the water. My head is down but there is still a minor problem.



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Appendix B Agenda and timeline for my first clinic

The agenda and time line of my first one-week clinic follows. This clinic was five days of 1-hour sessions. We had five swimmers of ages 10 to 11. All were experienced and successful YMCA competitors. Assisting me were two Needham high school team members. Both are technically good swimmers and work with the Charles River YMCA team throughout the year.

Session 1 was filming and stroke instruction in freestyle and backstroke. Session 2 was watching some backstroke video followed by video analysis of the session 1 swimming. After the analysis, the swimmers were back in the water to reinforce the critique comments. Sessions 3 and 4 were of the same format for the butterfly and breaststroke. We watched a butterfly video. Session 5 was for starts and turns.

Each swim and film day followed the same time line. First, we film two 25-yard swims of each of the day's strokes with both the above and under water camera running. This takes under 15 minutes. It is followed by 45 minutes of verbal stroke instruction, stroke drills and full stroke swims. The 45 minutes is evenly divided between the strokes. We do drills for body position, pull movements, and kick. After each area is addressed, we do full stroke swims. No drill or swim is for more than 50 yards. The final 15 minutes or what is left of our hour is devoted to under and surface filming of the day's strokes.

During the days of watching videos we only watch experts in one stroke a day. Backstroke and butterfly were selected because they do not always get the attention they need. Their complexities are better absorbed from video images. Video viewing was limited to 30 minutes. Ten minutes of this was watching the experts. This allowed 30 minutes of pool time and each swimmer receives some stroke reference material at the end of each video day.

In classes with more swimmers, the time to film would increase. Again using the concept of it needing only one complete stroke cycle to analyze, swimmers at spaced at a half of the pool interval. Film one lane and have them swim back in another.

Our first clinic went relatively smoothly. One hour a day to complete everything we would like to teach is difficult. Because of the YMCA pool schedule we were not be able to get more pool time per day. All the swimmers enrolled in this program are 12 or younger. Our goal was to make two corrections per stroke for each swimmer and get across the independent basics of head/body position, core control and streamlining. Four of the five swimmers will attend the one week Technique Swim Camp at Harvard later in the summer. I think we have prepared them for this experience. The fifth swimmer saw her strokes for the first time and did not like what she saw. She is a gifted athlete and returns to her summer team knowing what to focus on. I will also have her swim for me in the fall.

In future, clinics I will prepare a specific sequence of drills and full stroke swims to use on days one and three. With this will be a glossary of terms to use when doing the instruction. My two teenage assistants come from different age group programs. This will insure we stay on message and keep to our time schedule. Next year we will change the clinics to two strokes in five days and may go to two-hour sessions. We need more time to insure the younger swimmers understand the changes to make. An outline of the two-hour sessions with specific drill and lecture notes is being prepared. I also want the teenagers to do more of the basic overview verbal instruction. This will help them improve their own swimming and give them a sense of ownership in the program. We are also preparing a small handout covering the strokes, rules and a glossary to give to each attendee. It will contain a section to write notes and major stroke changes to make. Again, the assistants are part of the development process.

Appendix C Needham Channel Information

Here is information courtesy of the Needham Channel. First is the procedure to buy a copy of the Swimming Rules episode 2 covering competitive strokes and rules for age group swimmers. This is followed by a series of tips on camera work by Marc Mandel, the station's Executive Director.

If you would like a copy of any program seen on the Needham Channel, you can place your request by mailing us your request with **a blank VHS Cassette or DVD-R, a postage-paid, self-addressed envelope, a check for payment and your phone number**. We will phone to notify you that the program has been mailed. Our address is:

**The Needham Channel
257 Chestnut Street, Floor 1
Needham, MA 02492**

Note: The Needham Channel is not responsible for items lost in the mail. If you prefer to have your tape sent certified or insured, please enclose the appropriate payment for those extra services.

Please note that all programs are copyrighted to their producers, the Needham Channel, and/or other licensing agencies. The tapes produced at the Needham Channel are intended for private home-use only. Additional duplication without permission of the Needham Channel is prohibited.

To have another public access station acquire a copy of the program, they should contact the Executive Director at the above address.

Tech Tip: Focus!

In today's day and age, many cameras come with auto focus. For those working with an "old-school" camera, or those seeking more artistic shots, you'll need to focus your camera shots manually. The ring around the front of your lens is the focus ring. We use this ring to sharpen the subject of your shot. However, you can not always trust your eyes to tell you if a shot is in focus. Small viewfinders and LCD screens can confuse the eye into believing a shot is in focus when it is not. When your subject is stationary, the best thing to do is zoom all the way in (when focusing on a person I like to zoom into their eyes) and adjust the focus ring, until you get a sharp image. Then you can zoom out to get your shot. You will remain in focus unless you change the distance between the camera and your subject. If your subject is on the move, the wider your shot is, the more "in focus" it will look. Either way it takes a lot of *focus* to maintain a sharp picture. Sorry. I couldn't help myself there...



Tech Tip: The Human Tripod

You are out on a shoot, start setting up, and realize you forgot the tripod. Shame on you! Actually, it happens all the time. There are a few things that can be done to help provide a steady usable shot. First off, take advantage of your mobility. Do not zoom in unless you have to. The closer you zoom in, the shakier your shot looks. Move closer to your subject when you need a close-up. Next, stand with your feet shoulder width apart, and your knees slightly bent. Don't bend them too much, or it becomes an exercise in strength. Just keep them bent enough so they are not "locked". Finally, keep your arms close to your body. If you are carrying a small camcorder, try to keep your elbow touching your side. If you have a large camera, use your other arm to brace your elbow across your stomach. Keep these tips in mind, and you will become "The Human Tripod".



Appendix D Sample Agenda for 1/week 2hr/day Clinics

Two Hour per Day Clinic Agenda Long Axis Strokes

	Time
Day 1 Freestyle	
Greeting and overview	5 min
Welcome	
Introduce staff	
Objective	
Improve your strokes	
Go away with two changes to work on	
Have some fun while learning	
What we teach	10 min
Body Balance and streamline	
Kick and core rotation	
Pull Pattern	
Full stroke	
Fast with form	
Stroke and Drill Demo	5 min
Body Balance	
Kick and core rotation	
Pull Pattern	
Full stroke	
Drills	30 min
Balance and body position – float	
Body position and kick	
Vertical kick	
Pull Pattern	
Standing drill – bend over in waist deep water hand, wrist & elbow enter through one hole in the water. Next, make this a moving drill. Fingers enter in front of shoulder. Anchor hand and walk past hand. Keep elbow high.	
Face up and face down - Full extension of arm & Hands in front of shoulder	
Stroke counting during swims	
Break	10 min
Lecture on Motivation and goal setting	10 min
Full Stroke Swims	20 min
Focus points - body and head position	
Core rotation	
Arm and hand entry	
Elbows high	
Video	20 min
Wrap up	10 min
Day 2 Freestyle	
Watch DVD	15 min
Watch Clinic Video	15 min
Instructor takes notes on each swimmer	
Review what each swimmer must work on	5 min
Drills	25 min
Full Swims	20 min
Break	10 min
Fast Swims plus critique	20 min
Wrap up	10 min

Day 3 Back stroke	Time
What we teach	10 min
Body Balance	
Kick and core rotation	
Pull Pattern	
Full stroke	
Fast with form	
Stroke and Drill Demo	5 min
Body Balance	
Kick and core rotation	
Pull Pattern	
Full stroke	
Drills	30 min
Kick and rotation	
One arm backstroke alternate arms	
Goggles on face	
Break	10 min
Lecture Proper diet, rest and taper	10 min
Full Stroke Swims	20 min
Video	20 min
Wrap up	10 min
Day 4 Backstroke	
Watch DVD	15 min
Watch Clinic Video	15 min
Instructor takes notes on each swimmer	
Review what each swimmer must work on	5 min
Drills	20 min
Repeat day 3 Full Swims	20 min
Break	10 min
Fast Swims plus critique	20 min
Wrap up	10 min

Two Hour per Day Clinic Agenda Short Axis strokes

Day 1 Butterfly	Time
Greeting and overview	5 min
Welcome	
Introduce staff	
Objective	
Improve your strokes	
Go away with two changes to work on	
Have some fun while learning	
What we teach	10 min
Body Balance	
Kick and core rotation	
Pull Pattern	
Full stroke	
Fast with form	
Stroke and Drill Demo	5 min
Body Balance	
Kick and core rotation	
Pull Pattern	
Full stroke	
Drills	30 min
Hips up and down undulation movement	
Kicking on front, back and side	

	Vertical kicking	
	One arm butterfly	
	Break	10 min
	Lecture on Motivation and goal setting	10 min
	One arm and Full Stroke Swims	20 min
	Video	20 min
	Wrap up	10 min
Day 2	Butterfly	Time
	Watch DVD	15 min
	Watch Clinic Video	15 min
	Instructor takes notes on each swimmer	
	Review what each swimmer must work on	5 min
	Drills	20 min
	Full Swims	20 min
	Break	10 min
	Fast Swims plus critique	20 min
	Wrap up	10 min
Day 3	Breaststroke	Time
	What we teach	10 min
	Body Balance	
	Kick and core rotation	
	Pull Pattern	
	Full stroke	
	Fast with form	
	Stroke and Drill Demo	5 min
	Body Balance	
	Kick and core rotation	
	Pull Pattern	
	Full stroke	
	Drills	30 min
	Kick with noodle between legs	
	Kick on back	
	Double kick to one arm stroke	
	Hand paddle scull	
	Arms and fly kick	
	Break	10 min
	Lecture on proper diet, rest and taper	20 min
	Full Stroke Swims	30 min
	Video	20 min
	Wrap up	10 min
Day 4	Breaststroke	Time
	Watch DVD	15 min
	Watch Clinic Video	15 min
	Instructor takes notes on each swimmer	
	Review what each swimmer must work on	5 min
	Drills	20 min
	Full Swims	20 min
	Break	10 min
	Fast Swims plus critique	25 min
	Wrap up	10 min
Day 5	All clinics	Time
	Set pool up as 4 lanes	
	Turn general lecture	10 min
	Rules for clinic strokes	
	Stroke specific techniques	
	Stroke 1 turn specifics and practice	15 min

Free and back – flips	
Breaststroke - pullouts	
Stroke 2 turn specifics and practice	10 min
Back – roll and flip	
Butterfly	
IM turns specifics and practice	10 min
Break	10 min
Starts	15 min
Lecture Race strategies	10 min
Stroke review	5 min
Drills	10 min
Full stroke swims – two strokes	10 min
Two focus areas – students describe before swims	
Fun stuff	15 min
Relay races	
Starts long underwater kicking against come up and swim contests	

An optional drill is to remove lane lines and do turns across the pool. For a four-lane pool, place a lane line in the center. Push off before turn must go under the lane line before swimming. Push off after turn must go under lane line. For older kids, place the lane line between lanes 3 and 4 to extend the after turn underwater push off and kick before swimming. I expect a lane line in the center of a 6 lane pool would work for older swimmers.

To assist swimmers to flip at the correct distance from the wall put a movable marker on the bottom and adjust its position as swimmers execute turns. I use a yellow hand paddle with a weight tied to it. It quickly helps young swimmer avoid turning too close to the wall.

I recommend using GoSwim's All Strokes DVD of Kaitlin Sandeno and Erik Vendt if you plan to show examples of championship form. It has great shots with just the right amount of talk so you can interject your comments. This is especially good for younger swimmers. It is easy to navigate to whatever stroke you want to show.

Handout material

I have handout material that I will use in my youth clinics. I am happy to share this with any individual or organization that would like to use is on three conditions.

1. I am given credit as the author.
2. It will not be sold.
3. Suggestions for changes will be sent to me for incorporation. I will give credit to anyone making a major suggestion if I use the material.

Contact me at the following email address: rboder -at- Comcast.net if you want a copy.

Appendix E Thoughts for Masters Programs

This section is to propose some programming ideas that would appeal to Masters Swimmers. First, I have made some assumptions that may or may not be true. They are:

- Swimmers in practice groups coached by college level coaches have little or no interest in technique clinics.
- There are a significant number of master's swimmers in no formal training program. They would benefit from this type of coaching help.
- Access to a clinic must be easy in terms of location, time and cost.

These are big hurdles to jump. So what should we do? Make programs that appeal to the impulse or convenience consumer. For example:

- Shot and finalize videos as the North Shore YMCA does with comments by a respected coach. This could include both surface and underwater video. Produce a DVD for each swimmer to take home and study.
- Set up an NEM clinic team for small practice groups or be an additional resource to help conduct programs for larger groups. Have more than one lane with cameras or skilled analyst.
- Set up a program at meets. Have a lane to do video. Offer to shoot and finalize a DVD to take home. Shoot the warm ups in a specific lane and replay the video during a meet. Our meets need to kick the excitement up a notch. This may help.

Set up a program for triathlon participants. Improving their swimming skills is the best thing the majority can do. We have the skills and facilities to help these people. It is a marketing opportunity for our club.

Form partnerships with organizations that can provide pool time. We need ease of access and convenient times. They need programs to draw more swimmers and fill under used pool time.

Add a presentation on the value of a Masters membership to the clinic agenda.

Appendix F Material not yet incorporated into the paper.

This includes ideas and concepts I have developed after the primary material was written.

A reply to Bill Ewan, a Masters swimmer and coach in Rhode Island, on an email Dec 27, 2007. We are working on a project for the New England Masters.

I used both the underwater and above water cameras with the high school swim team on Weds. Night (Dec 27, 2006) There were just under 20 swimmers. We got through 3 sets of 25 yard swims of each stroke in under a half hour. Then we started to review the images. The high school coach went through the underwater video analysis in a half hour. We only had an hour of pool time. Getting the kids in and started took about 15 minutes. This is not a highly motivated team by any means. There are always a few late ones. By time we got them upstairs to watch video another 10 minutes went by. Bottom line is for 1/2 hr of video if you have both above and below water images to analyze you need 1 hour of time. My son felt we really need 1 swim of each stroke not 3. The 3 were good from my standpoint because I didn't start with a fresh DVD so I didn't have all the swims on 1 DVD. The VHS underwater images were a little harder to work with since we didn't have a remote control on the TV. The kids and the team coach really enjoyed the experience. This reinforced some of my ideas on sessions. First you really need a minimum of 2 hours to do anything more that just collect data. The data has to be on a media that you can stop/start, slow motion and freeze frame. Finally leaving the videos with the coach is important. For our sessions we should have at least 2 DVD recorders if possible. VHS is less desirable. The real answer to doing this on a frequent basis is to have a DVR (TVIO like recorder) especially if the recorder can produce DVD output of the session, so the coach can work with it over time.

This way you can record and play back on the pool deck at the same time. This is a technology I may get for my team. I have to do my homework on what is available in the market place.

As a coach I have a hard time setting up staged sessions to do this stuff. Much of that is the limited space environment I operate in. It would be nice to have on deck at all times the equipment to collect images of every practice and call out swimmers to review specific faults. For me it is easier to get qualified assistant coaches than it is to find space and setup team sessions. An assistant coach or myself one on one with a swimmer will lead to faster stroke corrections! I think this is the real key to future success with this technology for smaller programs such as YMCAs and Masters. Throw away the data you don't need. Use what you do need on an immediate basis. We now live in a visual world and the equipment to record it is inexpensive. We need to figure out how to do this. This is the next real opportunity to advance coaching.

As I think about what you said when we met. This immediate use message is the most powerful contribution to swimming we can make. I think this should be the base of what we say to the workout groups and try to develop. With what technology is available, even the smallest teams can collect and analyze data in any and every setting they think is appropriate. The cheapest way to go is find a family(s) with a camera and a TVIO and bring them to a practice or two.

Two Hour per Day Clinic Agenda for a Single Stroke

Freestyle	Time
Greeting and overview	5 min
Welcome	
Introduce staff	
Objective	
Improve your strokes	
Introduce using video techniques	
Go away with two changes to work on	
What we teach	
Body Balance and streamline	
Kick and core rotation	
Pull Pattern	
Full stroke	
Fast with form	
Shoot video of each swimmer	10 minutes
Analyze each swimmer	20 – 30 minutes
point out what to work on swimmer needs to keep track of flaws	
Only point out flaws and keep track of flaws by swimmer. Use this to determine demo and drill agenda.	
Group agreement on what to work on?	
Stroke and Drill Demo or show DVD	5 min
Body Balance	
Kick and core rotation	
Pull Pattern	
Full stroke	
Break	5 min
Drills	30 min

Mention individual swimmers and have them try the correction in each of these areas.

Balance and body position – float	
Body position and kick	
Body position and breathing	
Pull Pattern	
Standing drill – bend over in waist deep water hand, wrist & elbow enter through one hole in the water. Next, make this a moving drill. Fingers enter in front of shoulder. Anchor hand and walk past hand. Keep elbow high.	
Face up and face down - Full extension of arm & Hands in front of shoulder	
Stroke counting during swims	
Full Stroke Swims	10 min
Focus points - body and head position	
Core rotation	
Arm and hand entry	
Elbows high	
Video to leave with coach	20 min
above water DVD-R finalized for showing	
Wrap up	10 min

Material to send in advance
 Agenda
 Video primer

Material to leave

Reference articles and web sites
DVD