Qualitative Analysis
Steps in a Qualitative Analysis

- Preparation
- Observation
- Evaluation and Diagnosis
- Intervention
Preparation

- The first task is to build a prerequisite knowledge base:
  - Knowledge about the activity or movement
  - Knowledge about the performer(s)
  - Knowledge about effective instruction
  - Knowledge about systematic observational strategy
Knowledge of the Activity

- Determine the overall performance objective, or *goal* of the movement.
- Need to know about the skills, strategy, and physical requirements of the activity.
Knowledge of the Activity

Sources of information:
- Experience
- Expert opinion
- Scientific research
Experience

- Invaluable in any profession.
- Possible weakness is that it is often anecdotal and can be influenced by personal bias.
Opinions of experts usually carry a lot of weight.
Available sources are professional publications and professional meetings.
Possible weakness is conflicting and changing opinions.
Opinions are often influenced by the technique of a current champion, which may or may not be proper.

Skilled performers often perform with little conscious thought about the process, and may not be the best source of information.
Scientific Research

- Provides the most valid and accurate information available for basing decisions about qualitative analysis.
- Unfortunately, practitioners often have difficulty understanding the research literature.
Professionals in human movement must weigh the evidence based on their own experience, expert opinion, and scientific research. The latter is probably the most valid because of its objectivity and experimental control.
Critical Features

- **Key features of a movement that are necessary for optimal performance.**
- based on the safety, effectiveness, and efficiency of the movement.
- their exact sequence or coordination is also very important.
Critical Features

- Statements describing specific body movements that are observable.
- Used to evaluate whether the key mechanical factors have been performed ideally.
A professional must decide if a particular technique is safe for the performer. Considerations include:

- age of the performer
- level of conditioning
- injury status
- previous activity (readiness)
Critical features should be defined as precisely as possible, but need to allow for variations inherent in performers.

- length/direction of stride in pitching
- angle of release of basketball free throw
Identifying Critical Features

- Identify the overall performance objective. Rank secondary objectives in order of importance.
- Divide the skill into discrete parts.
- Identify the mechanical purpose of each discrete part.
Identifying Critical Features

- List the biomechanical factors that determine the accomplishment of the mechanical purpose.
- Identify the biomechanical principles that relate to the biomechanical factors of the performance.
Identifying Critical Features

- List the **critical features** of each part that would contribute to the successful accomplishment of the mechanical purpose of that discrete part, and ultimately to the overall performance objective.
Knowledge of the physical, cognitive, and emotional characteristics of performers is important in preparing for qualitative analysis.

Performers have a wide variety of abilities based on genetics, age, gender, anthropometrics, experience, training, and skill-related fitness components.
Knowledge of Effective Instruction

- Prerequisite knowledge of pedagogical and motor learning research.
- An essential task is translating the critical features into teaching cues.
  - The performer’s age, experience, and interest level may affect the choice of communication techniques.
Effective teachers provide a good demonstration of the skill, explicit verbal explanation, summary cues, direction of student attention to important factors (critical features), and a way to check for student understanding.
Knowledge of Systematic Observational Strategy

- phases of the movement
- appropriate vantage points
- visual limitations
- number of observations needed
- checklists or rating scales
Observation

“You can observe a lot just by watchin’.”

--- Yogi Berra
Systematic Observational Strategy

- A plan to gather all the relevant information about a human movement
- Involves two main decisions:
  - what to observe
  - how to observe it
Systematic Observational Strategy

- **Critical features** will be the targets of observation.
- **Sensory and information processing limitations** must be considered.
- Our **knowledge and expectations** strongly influence what is observed.
  - “We can only see in a picture what our experience permits us to see.” (Dale, 1984)
Key Elements in a Systematic Observational Strategy

- which critical features to focus attention on
- how to control the situation
- vantage points of observation
- the number of observations needed
- whether extended observation will be needed
Focus of Observation

- **Critical features** - the focal points for observational strategy to follow

- **Scanning strategy** - planning focuses of attention
  - what to look for
  - when
  - how long to look
Focus of Observation

- Environmental constraints
  - rules of the sport
  - psychological stress
  - fatigue
  - interactive nature of open skills
Focus of Observation

● *Phases of the Movement*
  - preparation, execution, follow-through
  - most common scanning strategy
  - observe critical features in sequential order
  - decreases risk of perceptual overload
  - observe body component through the temporal (serial) phases of the movement
Focus of Observation

**Balance**

- movement in many sports is strongly affected by variations in balance
- base of support and initial movements of the lower extremities often affect the actions of subsequent segments
Focus of Observation

- **Importance**
  - observe the most important feature first.
    - observational strategy is based on a ranking of the relative importance of the critical features
    - some critical features may influence other aspects of the movement more than others
Focus of Observation

- **General to Specific**

- analyst considers all the parts of a movement and develops an overall impression of the quality of the movement.

- if the analyst feels there is something wrong, s/he can focus on the phases &/or body parts
Observational Situation

- The environment should be controlled as much as possible by the analyst, yet the task must be as realistic as possible.
  - difficult, since qualitative analysis is most often performed in live competition
  - easier with closed skills
  - more difficult with open skills
Observational Situation

- **Open skills** - performed in an unpredictable, changing environment
- **Closed skills** - performed in a predictable environment; the performer is free to execute skill without making quick decisions and unexpected changes.
For **open skills** the analyst needs to plan observational situations that mimic the competitive environment.

Even **closed skills** can be made more realistic with psychological pressure (basketball free throw).

Remember the very fact that someone is watching can have an affect on performers.
Vantage Points

- Specify the optimal positions for observing a particular movement.
- Most common is at right angles to the plane of motion.
- Many movements will require several vantage points.
- Most movement is three-dimensional.
Vantage Points

- should have stable backgrounds without distractions or moving objects
- a uniform background of contrasting color is best
- horizontal &/or vertical references could be helpful in some cases (release angle)
The observer’s distance from the movement is determined by the nature and speed of the movement.

- the faster the movement, the greater the viewing distance
- space may limit the maximum distance
- closer vantage points are possible when observing slow, restricted movements
Number of Observations

- A compromise between gathering enough information for a good evaluation, and the time constraints of the situation.

- Number of trials affected by:
  - performer’s consistency
  - analyst’s experience
  - complexity of the skill

- Rule of thumb is 5 to 8 trials
Extended Observation

- A plan for gathering more information than is usually observable.
- Utilized when a critical feature of interest is difficult to see.
- Extended observation includes:
  - using video
  - using multiple observers
  - using multiple senses
Performer Involvement

- The performer’s observations can supplement the information collected by the analyst.
- Example: performer can provide feedback on how it felt (solid contact at sweet spot)
- Could help motivate performer to take ownership in the process and implement suggestions.
Evaluation & Diagnosis

The Third Task
of
Qualitative Analysis
A critical *evaluation* of desirable and undesirable aspects of a performance and a *diagnosis* of the movement lead to a priority ranking of the corrective action the analyst will take.

May be the most difficult task in qualitative analysis.
Evaluation & Diagnosis

• **Evaluation** - a judgment of the quality of the movement; the strengths and weaknesses of the performance.

• **Diagnosis** - critical scrutiny and judgment in differentiating a problem from its symptoms.
Evaluation may ask:

- Are the critical features of the movement within the desirable range?
- What are the strengths of the performance?
- What are the weaknesses or errors?
The Process of Evaluation

- To keep the task manageable, select no more than five to eight critical features.

- Specify as completely as possible the *range of correctness* of all critical features to be evaluated.
The Process of Evaluation

- Evaluate performance on each of the critical features using a simple rating scale, such as:
  - inadequate
  - within the desirable range
  - excessive
Performance Variability

- When first learning a skill, performers exhibit a wide variety of errors.
- Analyst should view the movement several times (5-8).
- The error made in any one trial may be insignificant. Look for patterns.
Performance Variability

- Skilled performers are more consistent.

- Strengths and weaknesses are more subtle.
  - However, also more consistent.
Hoffman’s (1983) diagnostic problem-solving approach

Figure 7.2  The kinds of performance errors that form the basis of Hoffman’s diagnostic problem-solving approach to qualitative analysis (1983).
Ideal Form vs. Critical Features

- Critical features of any skill are dynamic and interact with a multitude of factors that affect performance.
- This interaction of critical features, performer traits, movement environment, and other factors makes it difficult to establish one ideal form for a particular movement.
Ideal Form vs. Critical Features

- Closed environment skills are likely to have a tighter range of correctness, and thus conform more closely to the concept of an ideal form.

- Open environment skills require greater flexibility, thus requiring the analyst to focus more on critical features and fundamental mechanical principles.
Summary

- Analysis involves judging the strengths and weaknesses of a person’s performance.

- Critical features should be evaluated only after an adequate systematic observation has been performed to gather relevant information.
A few (5-8) critical features should be evaluated to one of three levels:
- inadequate
- within the desirable range
- excessive
Diagnosis

- Once we’ve identified errors (evaluation), how do we deal with them?
- The purpose of diagnosis is to narrow the strengths and weaknesses in the performance to focus on the single most important intervention.
Prioritizing Intervention

- Motor learning and psychology research suggests that most learners can focus on only one correction at a time during practice.

- Therefore, the analyst must prioritize intervention.
Prioritizing Intervention

- Little systematic research exists to validate a specific process for the diagnosis of performance.
- Difficult because the cause of a particular problem may be far removed from its observable effects (symptoms).
- A thorough understanding of biomechanical principles is the analyst’s best ally.
Prioritizing Intervention

Six logical rationales have been proposed for prioritizing intervention:

- relationship to previous action
- maximizing improvement
- order of difficulty
- correct sequence
- base of support
- critical features first
Prioritizing Intervention

- Whichever approach is used to prioritize intervention, it is important to keep in mind the goal or purpose of the movement being analyzed; this will help shape priorities for corrections.

- The best rationale may be specific to the person or the motor skill.
Some errors are only symptoms because they are caused by another problem.

A coach who focuses practice on errors symptomatic of another problem is wasting valuable practice time.
Relationship to Previous Action

- Not always easy to establish exactly what actions are related to what other actions.

- Ability to relate actions improves with increased knowledge of biomechanics and practical experience in qualitative analysis.
Maximizing Improvement

- Select intervention that can be expected to maximize improvement.
- Not always clear how to judge which correction leads to the most improvement.
- Initial improvement or long-range improvement?
In Order of Difficulty

- Make the *easiest corrections first*, if movement errors seem unrelated and of equal rank.
- Leads to performer’s perceived success, improvement, and thus greater motivation.
- No scientific evidence that this is most effective in improving performance.
Provide intervention in the *sequence of the actions* in the motor skill.

Little scientific evidence to support this domino theory.

However, actions are sequential, and many errors are related to previous actions.
Base of Support

- For activities requiring balance or the control of large forces generated by the legs, focusing first on the base of support may be a logical strategy.
Critical Features First

- Improve *critical features first*, before other minor errors in performance.
- If the right critical features have been selected, they are obviously (by definition) most critical to the movement.
- Most movements have several critical features; how does one determine which are most important?
Analysts must be deliberate in the evaluation and diagnosis of performance. Analyst must be absolutely sure of himself/herself before intervention with performer. Inappropriate feedback may frustrate the performer and damage the analyst’s credibility.
Intervention

Strategies for Improving Performance
**Intervention**

- *Intervention* is the analyst’s administration of feedback, corrections, or other changes in the environment to improve performance.

- Has been given a variety of names:
  - feedback
  - remediation
  - instructions to performers
Intervention

More comprehensive than just feedback, instruction and/or error correction:
- positive reinforcement
- modeling
- physical guidance
- modify practice
- prescribe training
- adjusting equipment
The predominant mode of intervention is *verbal feedback*.

*Intrinsic feedback* - information about the outcome.

*Extrinsic feedback* - comes from an external source after the movement has been completed.
Movement feedback has three major functions:
- guidance
- reinforcement
- motivation
Guidance Function of Feedback

- Guidance is the information that feedback provides to correct movement errors.
- Correct feedback provides the most appropriate mental images that help the person shape the next response.
- Negative feedback (“don’t” message) communicates a discouraging message.
Reinforcement Function of Feedback

- **Positive** - encourages correct technique.
- **Negative** - intended to diminish the frequency of undesirable actions.
  - Appropriate when behavior is dangerous or improper.
  - Should be used sparingly.
  - Can result in an adversarial relationship.
Motivation Function of Feedback

- Positive feedback that rewards consistent effort tends to create a positive attitude and climate.
- Pedagogy research has shown that good teachers provide a lot of positive feedback.
The higher the skill level of the performer, the more important the motivation function of feedback becomes.

- Improvement comes more slowly, is more difficult, and requires more practice.
- Highly skilled performers often resist change, because performance suffers in the short term.
Classifications of Feedback

- **Knowledge of Results (KR)** - information about the outcome (product). Easily observable in most activities.

- **Knowledge of Performance (KP)** - information about the movement process.
Classifications of Feedback

- Studies have shown that KP is more effective than KR in improving performance.
- The analyst should select the mode of feedback that matches the movement and environment.
  - If a critical feature related to a body movement needs improvement, KP is more effective.
  - KR can also provide important feedback in many open skills, where the ability to react to the environment determines success.
Principles for Providing Feedback

The literature suggests 7 guidelines for providing feedback:

- Don’t give too much feedback
- Be specific
- Don’t delay feedback
- Keep it positive
- Provide frequent feedback for novices
- Use cue words or phrases
- Use a variety of approaches
Don’t Give Too Much Feedback

- A common mistake that leads to “paralysis by analysis.”
- Even if the performer understands the feedback, s/he can become overloaded.
- Remember the objective of *diagnosis* is to select *one* intervention at a time.
- Performance can suffer from trying to keep too many things in mind.
Be Specific

- Focus on the exact element and how it needs to be changed.
- Feedback should be specific to the motor skill and at the student’s level of understanding.
- Tailor the feedback to each individual.
In general, learners tend to be **visual, auditory, or kinesthetic**.

- **Visual learners** respond well to demonstration, video, diagrams, etc.
- **Auditory learners** tend to remember the words used by the instructor, so cues are helpful for them.
- **Kinesthetic learners** could benefit from manual guidance.
Don’t Delay Feedback

- Immediate feedback helps learners make connections between that feedback and their kinesthetic sense and proprioceptive information (intrinsic KP) from the trial.

- Research suggests that feedback need not be instantaneous, and that summary feedback is effective.
Keep It Positive

- Most effective feedback is worded to instruct the performer with a positive connotation.
- Research has shown much of the feedback in physical education settings is negative.
- Feedback should encourage the student and paint a positive picture of his or her potential.
Provide Frequent Feedback

- Frequent feedback is especially important in the early stages of learning a new skill.
- The frequency of feedback should decrease as the skill level of the performer increases.
  - Skilled performers **need** to rely more on their kinesthetic and proprioceptive intrinsic feedback.
Performers can remember and use information in practice better if it is presented in concise words or phrases.
Use a Variety of Approaches

- Provide several cues to communicate the essential idea of each critical feature.
- Use a variety of modes to communicate these cues.
- Use age-appropriate cues.
- Questioning is a good technique to determine whether the performer understands.
Methods for providing feedback beyond conventional verbal feedback include:

- Visual models
- Exaggeration or overcompensation
- Modifying the task or practice
- Manual or mechanical guidance
- Conditioning
Visual Models

- Demonstrations by the instructor
- Posters of key body positions
- Skilled models similar to the performers
- Videotape replay
Exaggeration/Overcompensation

- Previously-learned motor program is an obstacle to creating change.
- Exaggeration or overcompensation may be necessary to attain the desired change.
- Performer should be informed later that exaggeration was necessary to create the desired change.
  - Do not let misconceptions persist.
Modifying the Task or Practice

- It may be necessary to make practice easier for novice performers to accommodate strength and skill deficits.
- Change practice routines frequently to challenge athletes and maintain motivation.
- When learning the basic motor program for a new skill, it may help to break the task into parts, make is easier, or eliminate attention to outcome.
Modifying the Task or Practice

- Learning a new motor skill should be performed in a closed environment.
- As skill level progresses, practice can be moved from a closed to a more open environment.
- Equipment that is lighter or heavier can be used to make the task easier or to provide a training effect.
Modifying the Task or Practice

- **Blocked practice** involves many repetitions or trials of a task before another task is introduced.
  - Motor learning research suggests this kind of practice leads to good practice performance, a false sense of security, and poor long-range improvement.
  - Effective in the early learning stages of a new skill to help develop a basic motor program.
Modifying the Task or Practice

- **Random practice** has practice trials alternating rapidly among different movements.
  - Results in poorer practice performance but better long-term motor learning.
Manual & Mechanical Guidance

- **Manual guidance** - giving the performer a kinesthetic sense of the position or action desired.
  - Must be considerate of comfort levels with touching.

- **Mechanical Guidance** - using some aid or mechanical device (e.g. swing aid, brace, etc.).
If the performer lacks the physiological traits to correctly execute the movement, prescribing strength training or flexibility exercises may be appropriate.