Whole and Part Practice

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## Credits

This presentation is based on the book by Magill & Anderson (2020).

## Learning Objectives

* Define the terms \_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_ as they relate to the relationships among the parts or components of a complex motor skill.
* Describe ways to apply the part-practice methods of \_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_ to the practice of motor skills.
* Describe several ways to apply \_\_\_\_\_\_\_\_\_\_ methods to the practice of motor skills.

## Definitions

* **Whole practice**
  + A practice strategy that involves practicing a skill \_\_\_\_\_\_\_\_\_\_ (i.e., as a whole)
* **Part practice**
  + A practice strategy that involves practicing \_\_\_\_\_\_\_\_\_\_ of a skill before practicing the whole skill

## Practice a Skill as a Whole or in Parts

The decision to practice a skill as a whole or in parts can be based on the \_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_ characteristics of the skill. Hypothesis by Naylor and Briggs, 1963.

* **Complexity:** \_\_\_\_\_\_\_\_\_\_ of parts or components and the degree of \_\_\_\_\_\_\_\_\_\_ that characterize a skill.
  + More complex tasks have \_\_\_\_\_\_\_\_\_\_ component parts and place more demands on \_\_\_\_\_\_\_\_\_\_.
  + Note: “Complexity” is distinct from “\_\_\_\_\_\_\_\_\_\_.”
* **Organization:** The \_\_\_\_\_\_\_\_\_\_ among the component parts of the skill.
  + Skill has a high level of organization when its component parts are \_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_ interdependent.
    - Example: \_\_\_\_\_\_\_\_\_\_.
  + Low level of organization: When the component parts are \_\_\_\_\_\_\_\_\_\_ independent.
    - Example: \_\_\_\_\_\_\_\_\_\_.

## Decisions to Use Whole or Part Practice

Assessing the levels of \_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_ of a skill.

* If the skill is \_\_\_\_\_\_\_\_\_\_ in \_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_ in \_\_\_\_\_\_\_\_\_\_, practice the whole skill.
* If the skill is \_\_\_\_\_\_\_\_\_\_ in \_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_ in \_\_\_\_\_\_\_\_\_\_, practice by using the part method.

See a closer look: The simplification method for learning three-ball juggling in the next slide.

## How to decide whether to use Whole or Part practice?

* One needs to \_\_\_\_\_\_\_\_\_\_ the skill
* According to Naylor and Briggs (1963), focus on:
  + \_\_\_\_\_\_\_\_\_\_
  + the extent to which the spatial-temporal characteristics are \_\_\_\_\_\_\_\_\_\_
  + decide which levels of \_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_ best represent the skill

## Organization vs. Complexity approach: beam routine in gymnastics

|  | Low Organization | High Organization |
| --- | --- | --- |
| **Low Complexity** |  | \_\_\_\_\_\_\_\_\_\_ |
| **High Complexity** | \_\_\_\_\_\_\_\_\_\_ |  |

Organization: The \_\_\_\_\_\_\_\_\_\_ among the component parts of the skill.

Complexity: \_\_\_\_\_\_\_\_\_\_ of parts or components and the degree of \_\_\_\_\_\_\_\_\_\_ that characterize a skill.

Rule of thumb

* If High in Organization –> one must use \_\_\_\_\_\_\_\_\_\_ because the parts are interconnected; else, either approach is ok.
* If High in Complexity –> one must use \_\_\_\_\_\_\_\_\_\_ because the parts are interconnected; else, either approach is ok.
* How would you practice a *balance beam routine* in gymnastics?
* Is the **Organization** High or Low
* Is the **Complexity** High or Low
* Answer: \_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_ –> \_\_\_\_\_\_\_\_\_\_ is the most effective

## Organization vs. Complexity approach: Baseball pitching

|  | Low Organization | High Organization |
| --- | --- | --- |
| **Low Complexity** |  | \_\_\_\_\_\_\_\_\_\_ |
| **High Complexity** | \_\_\_\_\_\_\_\_\_\_ |  |

Organization: The \_\_\_\_\_\_\_\_\_\_ among the component parts of the skill.

Complexity: \_\_\_\_\_\_\_\_\_\_ of parts or components and the degree of \_\_\_\_\_\_\_\_\_\_ that characterize a skill.

Rule of thumb

* If High in Organization –> one must use \_\_\_\_\_\_\_\_\_\_ because the parts are interconnected; else, either approach is ok.
* If High in Complexity –> one must use \_\_\_\_\_\_\_\_\_\_ because the parts are interconnected; else, either approach is ok.
* How would you practice *baseball pitching*?
* Is the **Organization** High or Low
* Is the **Complexity** High or Low
* Answer: \_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_ –> \_\_\_\_\_\_\_\_\_\_ is the most effective

## Part practice: Fractionization

* Definition: Fractionization is a part-practice strategy for skills requiring \_\_\_\_\_\_\_\_\_\_ (AC).
  + What is AC?
    - Tasks that demand \_\_\_\_\_\_\_\_\_\_ movements from each limb (arm or hand) simultaneously.
* Does it matter which limb to practice first?
  + The \_\_\_\_\_\_\_\_\_\_ of individual limb movements determines the order of practice.
    - Sherwood (1994) suggests starting with the more \_\_\_\_\_\_\_\_\_\_ limb.
* Controversy in Research
  + Mixed evidence on the efficacy of whole versus part-practice approaches.
  + Fractionization is supported as an effective strategy for asymmetric skills (Walter & Swinnen, 1994).

## **Examples**

Musical instruments like the \_\_\_\_\_\_\_\_\_\_ or sports skills like the \_\_\_\_\_\_\_\_\_\_.

## Segmentation - Intro

* Method
  + Start with practicing the \_\_\_\_\_\_\_\_\_\_, then progressively integrate additional parts, culminating in the whole skill.
  + The progression should ideally move from \_\_\_\_\_\_\_\_\_\_ to \_\_\_\_\_\_\_\_\_\_, optimizing learning outcomes.
* Overcoming Integration Challenges
  + Problem: Difficulty arises when trying to \_\_\_\_\_\_\_\_\_\_ separate parts of a skill learned in isolation.
  + Solution: \_\_\_\_\_\_\_\_\_\_ part practice reinforces the connection between parts as the learner advances.

## Segmentation - Advantages

* Allows \_\_\_\_\_\_\_\_\_\_ on individual parts, easing the cognitive load.
* Mitigates difficulties in \_\_\_\_\_\_\_\_\_\_ learned parts into a whole skill.
* Ideal for skills involving \_\_\_\_\_\_\_\_\_\_ of movements.
* Facilitates \_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_ coordination as parts are integrated.
* Combines the attentional benefits of part practice with the \_\_\_\_\_\_\_\_\_\_ advantages of whole practice.
* The learner progressively masters the coordination of parts while managing the \_\_\_\_\_\_\_\_\_\_ of the whole skill.

## Segmentation - Examples

* The breaststroke
  + It can be divided into \_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_.
  + Each part is learned separately before integrating them, focusing on \_\_\_\_\_\_\_\_\_\_ timing.
* Empirical Support for Segmentation
  + Watters (1992): Demonstrated benefits for \_\_\_\_\_\_\_\_\_\_ on a keyboard.
  + Ash and Holding (1990): Showed advantages for learning a \_\_\_\_\_\_\_\_\_\_.

## Simplification - Intro

* Definition: Simplification involves \_\_\_\_\_\_\_\_\_\_ a skill or its components to make it easier to perform.
* Aimed at helping learners grasp \_\_\_\_\_\_\_\_\_\_ skills by reducing difficulty.
* Strategies: Several methods can be used, each tailored to \_\_\_\_\_\_\_\_\_\_ types of skills.

## 1. Reducing Object Difficulty

* Technique: Use \_\_\_\_\_\_\_\_\_\_ objects to reduce task complexity.
* Example: Learning to juggle with \_\_\_\_\_\_\_\_\_\_ instead of balls to slow the movement.
* Research Support: Early practice with simpler objects aids in grasping the \_\_\_\_\_\_\_\_\_\_ (Hautala, 1988).

## 2. Reducing Attention Demands

* Strategy: Minimize the \_\_\_\_\_\_\_\_\_\_ by reducing the complexity of the task.
* Example: Using \_\_\_\_\_\_\_\_\_\_ while learning to slalom improves focus on movement coordination (Wulf et al., 1998; Wulf & Toole, 1999).
* Application: Body-weight support systems in gait rehabilitation reduce the cognitive load of \_\_\_\_\_\_\_\_\_\_ (Miller, Quinn, & Seddon, 2002).

## 3. Reducing Speed

* Purpose: \_\_\_\_\_\_\_\_\_\_ practice to emphasize the timing and spatial aspects of a skill.
* Benefit: Establishes essential \_\_\_\_\_\_\_\_\_\_ patterns that can be transferred to normal speeds.
* Evidence: Effective for learning both \_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_ (Walter & Swinnen, 1992).

## 4. Adding Auditory Cues

* Method: Incorporate \_\_\_\_\_\_\_\_\_\_ signals to guide the performance of skills.
* Success: Assists in improving gait in \_\_\_\_\_\_\_\_\_\_ patients (Thaut et al., 1996).
* Broader Application: Auditory cues aid various \_\_\_\_\_\_\_\_\_\_ and enhance motor rehabilitation (Rochester et al., 2009; White et al., 2009; Malcolm, Massie, & Thaut, 2009).

## 5. Sequencing Skill Progressions

* Approach: Gradually \_\_\_\_\_\_\_\_\_\_ the complexity of tasks in a sequenced manner.
* Example: Baseball players progressing from hitting off a \_\_\_\_\_\_\_\_\_\_ to hitting a pitched ball.
* Research: Shows benefits for learning \_\_\_\_\_\_\_\_\_\_ and increased \_\_\_\_\_\_\_\_\_\_ (Hebert, Landin, & Solmon, 2000; Stevens et al., 2012).

## 6. Simulators and Virtual Reality

* Advantages: Allows practice without \_\_\_\_\_\_\_\_\_\_ consequences and offers control over specific conditions.
* Examples: Diverse applications across \_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_, and \_\_\_\_\_\_\_\_\_\_ training.
* Effectiveness: Generally supported by research when similar to the \_\_\_\_\_\_\_\_\_\_ environment (Fisher et al., 2002; Howells et al., 2008).

# Other Approaches

## An Attention Approach to Part Practice in Whole Practice

* Premise: It’s possible to focus on \_\_\_\_\_\_\_\_\_\_ of a skill during whole practice to improve specific aspects.
* Advantage: Merges the benefits of both \_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_ practice strategies for skill development.

**Theoretical Support for the Attention Approach**

* Attention Theory: Kahneman’s model highlights ‘\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_’ as a key to allocating attention.
* Application: Directing attention to a \_\_\_\_\_\_\_\_\_\_ part of a skill during its performance.

## Empirical Evidence of Attention-Directing Strategy

* Study: Gopher, Weil, and Siegel (1989) on learning the \_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_.
* Findings: Directing attention to specific \_\_\_\_\_\_\_\_\_\_ of the game improved mastery.

**Implementation of Attention-Directing Strategy**

* Instructions focused on specific skill components, e.g., \_\_\_\_\_\_\_\_\_\_ the spaceship or \_\_\_\_\_\_\_\_\_\_ mines.
* The dual-strategy group (controlling spaceship first, then handling mines) \_\_\_\_\_\_\_\_\_\_ other groups.

## Teaching Implications

* Before deciding whether to practice a skill as a whole or by parts, \_\_\_\_\_\_\_\_\_\_ the skill to identify its component parts.
* After analyzing a skill and identifying its parts, determine the degree to which the performance of any one part \_\_\_\_\_\_\_\_\_\_ on the performance of the preceding part. When parts are characterized with this relationship, the parts should be practiced \_\_\_\_\_\_\_\_\_\_ rather than as separate parts.
* It is important not to assume that because parts can be \_\_\_\_\_\_\_\_\_\_, they should be practiced separately; the performance dependence on preceding and following parts should always \_\_\_\_\_\_\_\_\_\_ the decision concerning which parts to practice separately and which parts to practice together.
* When the parts of a skill follow a specific \_\_\_\_\_\_\_\_\_\_ of movements, the preferred way to engage in part practice is the \_\_\_\_\_\_\_\_\_\_ part method, in which parts are practiced in sequence and become increasingly larger until the whole skill can be practiced in its entirety.
* When practicing the parts of a skill is not advisable or possible, consider ways to \_\_\_\_\_\_\_\_\_\_ the whole skill before engaging people in performing the skill as it would be performed in its real-world context.
* When the technology is available, \_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_ provide excellent initial means of engaging people in practicing a skill before having them practice it as it would be performed in its real-world context.
* Directing attention to a part of a skill while performing the whole skill can be an effective way to \_\_\_\_\_\_\_\_\_\_ errors for parts of a skill that should not be practiced as separate parts.

## References

Magill, R. A., & Anderson, D. (2020). *Motor learning and control: concepts and applications*. McGraw-Hill Education. <https://www.bkstr.com/csunorthridgestore/product/motor-learning-and-control--concepts-and-applications-147614-1>