AMOUNT & PRACTICE DISTRIBUTION
PART I: Overlearning
Overlearning and Learning Motor Skills

- The amount of practice a person devotes to a skill is important in learning a motor skill.
- More practice is assumed to be better than less practice.
- Achieving a specific performance standard in a school setting or therapy session is usually associated with a specific time period of practice.
- Efficiency of practice become the focus when achieving optimal learning.
OVERLEARNING

- Overlearning is the continuation of practice beyond the amount needed to achieve a certain performance criterion.
TYPES OF SKILLS AND OVERLEARNING

- Procedural skills
- Dynamic Balance Skills
OVERLEARNING STRATEGY FOR LEARNING PROCEDURAL SKILLS

- A procedural skill requires a person to perform a series of discrete movements in a known order, such as a dance routine or completing a double play in baseball.

- Overlearning of a procedural skill decreases the amount of forgetting about the procedure.
Retraining of a Procedural Skill

- You learned the dance but have not practiced it for a while. You have forget several moves. How should we train you?

- A study found that immediate overtraining practice to relearn a skill was better strategy than spacing overtraining through out practice.
OVERLEARNING STRATEGY & BALANCE SKILLS

  - Balancing on a stabilometer
  - Criterion 28 out of 50 seconds
  - 0, 50, & 100% overlearning conditions

- Extra practice was beneficial

- Other key findings
  - But there appeared a point of “diminishing returns” in performance benefits.
  - The retention benefits past this point are not proportional to additional practice
OVERLEARNING STRATEGY IN A PHYSICAL EDUCATION CLASS.

- Demonstrated the presence of “diminished returns” for increasing learning of a two-step football punt (Goldberger & Gerney, 1990).
  - Teacher divided the class into five groups and assigned to a station (each station included a different component of the 2-step football punt) where they practiced for 5 minutes then rotated to another station.
  - Another group practiced the entire 25 minutes punting using task cards that described the skill to learned.

- **Key finding.** The station to station group produced the greatest retention of the 2-step football punt.
When would more practice lead to poorer retention & transfer?

- When the performer ceases to engage in any cognitive effort
- When the performer ceases to engage in practice variability
- Bottomline. Learning beyond the point of the criterion set by performer or practitioner depends on the performer’s level of cognitive effort and practice variability.
OVERLEARNING AND OTHER PRACTICE VARIABLES

- The amount of practice is not the sole critical variable influencing motor skill acquisition
  - “Practice does not make perfect; a perfect practice makes perfect.”
- Amount of practice interacts with other variables to influence learning, such as:
  - Type and frequency of feedback
  - Variability & specificity of practice
  - Demonstration & verbal instruction
  - Practice organization
IMPLICATIONS

- Overlearning is effective for learning skills that one must learn within a specified period or number of practices.
- There is a point of diminishing returns in overlearning a skill.
- Station to station overlearning strategy is an effective way to retain the performance.
- In retraining a skill, immediate overtraining is more effective than spreading the training over several practices.
- Overlearning strategy is effective for procedural and balance skills
- Overlearning strategy needs to accompany other variables that influence learning such as feedback, practice variability, etc.
PART II: Practice Distribution
PRACTICE DISTRIBUTION

- Spacing of practice

- Relative rest to work ratio in and across practice.
  - Mass
  - Distributive
DEFINING MASS AND DISTRIBUTIVE PRACTICE

- Mass practice schedule is the amount of rest between practice sessions or trials is very short or none at all.

- Distributive practice schedule is the amount of rest between practice sessions or trials are relatively long.
LENGTH OF PRACTICE SESSIONS

A prime concern is how to allotted amount of time within and between practice sessions.

-A teacher/PT may have only 9 days of classes/sessions to teach/develop several skills.

*Is it better to have longer (mass) practices then shorter (distributive) more frequent practices?*
Which one type of practice is better?

Baddeley and Longman’s typing study

All trainees received 60 hours of training
5 days per week

Researchers used mass practice and distributed schedules that varied the lengths and frequency of the training sessions.
CONCLUSIONS OF BADDELY AND LONGMEN’S STUDY

Amount of time:
Keep practice session short and only practice once a day led to better learning.

Speed of Typing
People learn skills better in large number of shorter sessions of practice than in sessions that are long and fewer in number.

Trainees preferred mass over distributive practice in learning the skill which is exactly opposite of the results.
Replication of Results

- Annett & Piech found that two 5 trial training sessions separated by one day was better than one ten trial session in shooting.
- Bouzid & Carwshaw found that shorter sessions were better than one 60 min sessions in learning work processing skills.
- Dail & Christina found that learning to putt in golf that short more frequent sessions were better than mass practice.
- Shea et al found that distributing practice sessions across a day resulted in better learning than massing for dynamic balance task.
Explanation for results?

Why does distributed practice sessions across more days lead to better typing:

1. Less levels of fatigue both mentally and physically.
2. Mass learning required less cognitive effort because of repetition becoming monotonous or boring.
3. Memory consolidation hypothesis, that is, to store in memory relevant information one requires a certain amount of time without additional practice to transfer the information to permanent memory.
PRACTICE DISTRIBUTION RESEARCH

- Two meta-analysis reviews indicated that the type of task was a variable related to the type of practice.
  - Donovan & Radoevich (1992)
  - Lee & Genovese (1988)
Meta Analyses Results

- **Continuous skills.** Both meta analysis found consist results that indicated distributed schedules lead to better learning than massed schedule.

- **Discrete skills.** Both meta-analyses found that massed practice schedules results in better learning for discrete skills.
PRACTICE SCHEDULES

What is/are the reason(s) for continuous skills to be practiced in a mass practice schedule where as discrete skills should be practiced in a distributive practice schedule?
Learning to play a musical instrument

- The piano teacher develops a schedule where the student should practice at least once a day for 15-20 minutes.
- The student does not comply and only practices twice a week for 60 minutes each practice.
- The piano teacher becomes discouraged with the student’s progress.
- The student decides that he or she is not very good and quits.
- Unfortunately, the practice strategy of the student predicted the outcome.
IMPLICATIONS

- More frequent, shorter practices produce higher retention than practices that are long and less frequent.
- Mass sessions too close together can lead to poorer long term results (cognitive effort, memory, self-discovery reasons)
- Continuous type like skills use distributive practice schedules while discrete skills use mass practice schedules.
- Never let the learner choose the length and frequency of practices because they prefer longer, less frequent practice sessions which results in poor retention of the skill(s).
Practice Organization
Rehabilitation Example
Patient

- Male
- 45
- Automobile injury (Femur & Lumbar Fractures)
- Closed Head Injury (3 months – Coma)
Assessment

- Rivenead & Gait Assessment
  - Gait
  - Transfer skills
Gait

- Regulatory
  - Heel to toe
  - Narrow base of support
  - Arms in opposition
  - Toe straight and forward (not in or outward)

- Non regulatory
  - Walking surface (carpet, hardwood floor)
  - Weight bearing (treadmill, full weight bearing)
  - Obstacles (around objects of different sizes)
  - Carrying objects while walking
  - Walking paths
  - Assisted or non assisted
Transfer Skills

- Up and down stairs
- Sit to Standing
- Stand to Sit
- Out of bed to standing
- Prone position to standing
How are these skills performed in real life?

In what ways? (practice variability)

In what environmental situations? (context specificity)
Practice Variability

- Walking (Closed)
  - Long Pole (assisted)
  - Walking on treadmill at the same speed
  - Floor grid walking
  - Walking on the same surface in the clinic
  - Walking path the same
  - Walk while carrying a 5 lbs bag

- Walking (Open)
  - Walking at different speeds
  - Walking on different surfaces
  - Walking around objects of different sizes
  - Walking paths vary
  - Walking carrying different weighted objects
  - Unassisted walking
Practice Variability

- Transition Skills (closed)
  - Same surface
  - Same chair height
  - Chair with arm rests
  - 3 step stair
  - Steps the same height
  - Same bed

- Transition Skills (Open)
  - Vary surfaces
  - Vary chair heights
  - Chairs with or without arm rests
  - Stair in hallway and outside
  - Vary softness of bed
Practice Specificity

Gait Situations
- Alone
- Among a crowd
- When it is dark?
- Across a busy intersection?
- At home? Work?

Transitions Situations
- Early in the morning after sleep
- Eating/dining
## Contextual Interference

<table>
<thead>
<tr>
<th>Blocked</th>
<th>Serial</th>
<th>Random</th>
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<tbody>
<tr>
<td>Gait (15 minutes)</td>
<td>Walking on treadmill</td>
<td>Stand to Sit</td>
</tr>
<tr>
<td>Transition (15 minutes)</td>
<td>Walking with poles</td>
<td>Walk with Poles</td>
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<tr>
<td></td>
<td>Walking unassisted</td>
<td>Walk Stairs</td>
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<tr>
<td></td>
<td>Walking Stairs</td>
<td>Pone to Stand</td>
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<td>Sit to stand</td>
<td>Bed to Stand</td>
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</tbody>
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Overlearning

- Walking (maybe!)
  - If the client has poor balance (yes)
  - If the client has good balance (No)

- Transitional Skills
  - All are procedural
  - I will overlearn these skills with the client
**Mass Versus Distributive**

- **Gait**
  - Continuous skills will practice in distributive fashion.
    - Rest to work

- **Transition Skills**
  - Discrete skills will practice in mass fashion
    - Work to rest

Practice will these skills will be short and more frequent!
Practice Organization
Physical Education Example
8th Grade Baseball/Softball Unit

- Middle School
- Co-ed Population
- 8th Graders (14-15 years of age)
- Physical Education Teacher
  - Introduce the situations of play
    - Stealing a base
    - Situations (runners on 1 & 3 with 1 out, bases loaded with no outs, runner on first with no outs, runner on 3rd base with 0 or 1 out)
  - Assess Hitting and Fielding*
Hitting

Regulatory Conditions
   Stance
   Weight Shift
   Hips then Shoulder then arm extension
   Timing

Non Regulatory Condition
   # of balls hit
   Type of pitcher
   Speed of the pitch
   Color of the ball
   Bat length
   Weather
   Location of ball
   Players on based or not on based
   Count
Fielding

- Regulatory
  - Ready position
  - Seeing the ball come off the bat
  - Transportation of limb
  - Retraction of the glove prior to ball contact
  - Grasp (catch)
  - Look & Set then throw

- Non regulatory
  - Player on based
  - Number of grounders or fly balls
  - Weather
  - Eyewear
  - Location of ball
  - Speed of ball
Situations

- Regulatory conditions
  - Throwing
  - Fielding

- Non regulatory conditions
  - Stealing a base
  - Runners on 1 & 3 based on number of outs
  - Runners on 3 based on number of outs
  - Runner on 1st based on number of outs
  - Type of field
Practice Variability

Hitting Closed
- Same speed
- Same location
- Same delivery
- Same Environment
- Same swing

Hitting Open
- Vary location of ball
- Vary speed of the ball
- Different pitchers
- Practice under the lights or during the day
Practice Variability

Fielding (Closed)
- Same type of grounder or fly ball
- Same location
- Same Speed
- Same type of catch

Fielding (open)
- Different grounders or fly balls
- Different locations
- Different speeds
- Different type of catch
  - One handed
  - Two handed
  - Underhanded
  - Overhanded
Practice Variability

**Situation (closed)**
- Same situation over and over with
  - Same speed
  - Same locations
  - Same strategy
  - Same number of outs

**Situation (Open)**
- Different situations involving
  - vary locations
  - vary speed
  - vary the strategy
  - vary the outs
Overlearning

**Hitting & Catching**
- Discrete skills
- Overlearning has little effect (reach criterion level then go on!)

**Situations**
- Procedural
- Overlearning would be effective
Mass or Distributive

Hitting & Catching
- Discrete skills
- Use Mass practice

Situations
- Discrete in nature
- Use mass practice

Practice of these skill will be short in length and frequent.
The End