The effects of feedback on mastery of a new motor skill: a pilot test.

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Abstract

Mastering physical movement occurs through motor learning and experience. Motor development is needed for successful acquisition of sport and other physical skills. A lack of motor skills has been associated with decrease physical activity later in life, which has been linked to a variety of hypokinetic diseases. The current pilot experiment will examine the differences in motor skill acquisition in college aged students. The pilot experiment will lead into a larger scale experiment examining acquisition across the lifespan, specifically the differences between elementary age students, college age students, and middle aged to older adults. The first year of the project included an extensive literature review followed by a plot examination of the number of trials it takes to master a new skill in each college age specifically.

Purpose

The purpose of this literature review was to gather information for a future research project to understand differences in new skill mastery and self-regulatory feedback mechanisms across the lifespan. A secondary purpose was to determine the most successful motor skill learning methods that could be used to further expertise in the classroom, athletics, and work place.

Literature Review

The literature review examined skill acquisition in a variety of age groups ranging from children to older adults. The review had several key findings outlined below:

The acquisition of skilled motor performance: fast and slow experience-driven changes in primary motor cortex.

- Young adults ages 23-42 yrs old
- Motor skill learning requires time and has two distinct phases; Fast learning: An initial, fast improvement phase; Slow learning: A slowly evolving, post-training incremental gains

Lifespan changes in motor activation and inhibition during choice reactions: A Laplacian ERP study

- Four age groups: 18 children (M=7.7yrs), 21 older children (M=11.9yrs), 17 young adults (M= 20.6yrs), 21 elderly adults (M=75.4yrs)
- Children had more full and partial incorrect responses than adult groups, young adults showed the shortest latencies while young children responded the slowest, followed by elderly adults then older children

Motor Learning in Children: Feedback Effects on Skill Acquisition

- 20 young adults (22-30yrs) and 20 children (8-14yrs)
- Adults who practiced with reduced feedback performed with increased consistency during the retention test and children required longer periods of practice with feedback reduced more gradually to optimize learning

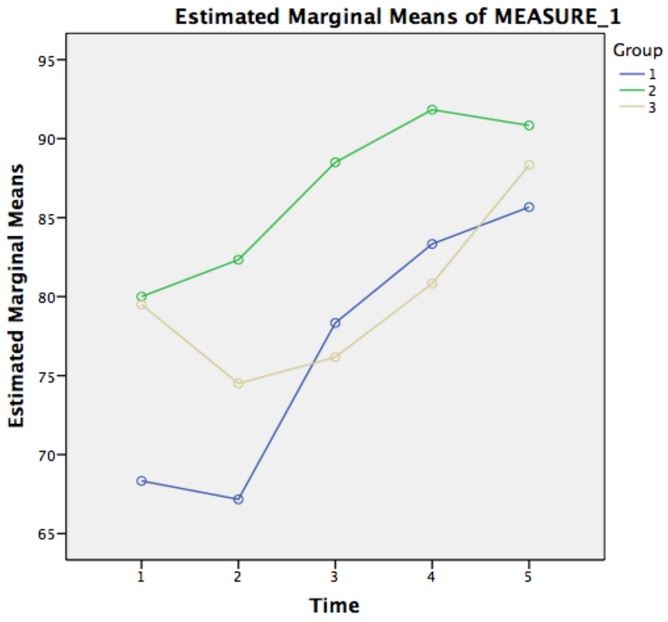
The best time to acquire new skills: age-related differences in implicit sequence learning across the human lifespan

- Sample (age range 4-85yrs) clustered into 9 age groups
- Acquiring new skills is significantly more effective until early adolescence than later in life

There were no studies that examined different types of feedback and their effect on various age groups. The current pilot project will test methods for a larger study that will examine skill acquisition in these groups with the overall goal to better understand which type of feedback best suits each population.

Literature Implications

- know how to allow the population to efficiently learn the skilled motor performance and why it works the way it does
- allows us to know what to expect from the population age groups in the future experiment as well as
- can be used to check children's results of future experiment and learn how and why children learn motor skill acquisition more efficiently over longer periods of time
- know what to expect for the overall outcome of the future experiment
- learn what to expect from the older population and compare results of which type of learning best suits this age population



Themes	Number
Verbal critiques from a side kick professional	10
Live demonstration; seeing side kick in person	5
More visual feedback	3
Receiving both types of feedback simultaneously	2
Positivity and encouragement helps motivation	2
More detailed video; better step-by-step instructions	1

Feedback Group	Number of Mastery
No Feedback	0
Auditory	5
Visual	2

Future Directions

- Examining of the number of trials it takes to master a new skill with a full-scale experiment in children, young adults, and older adults
- Self-regulatory feedback mechanisms that are most successful in each age category (auditory, visual, kinesthetic)
- Discover the most successful motor skill learning methods
- Examine the role that self-efficacy plays in skill acquisition
- Could be used to further expertise in the classroom, athletics, and work place

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Methods

Eighteen (18) subjects, ages 18-25 with no previous injuries and no previous martial arts experience, were recruited to learn, perform, and attempt to master a side kick movement. Participants completed an informed consent basic health history questionnaire. Participants were randomly assigned into one of three groups: visual feedback, auditory feedback or no feedback. Prior to the trials, subjects did a light warm-up and viewed a video of the movement. Each participant began their 20 trials using the preferred side of the body within 5 minutes of viewing the instructional video and watched the video throughout all attempts. The attempts were recorded with a video camera on a tripod set at the same angle for evaluation. Participants were asked to perform the skill for 20 trials while only receiving the type of coaching feedback each participant was assigned. Visual feedback groups were placed in front of a mirror, auditory feedback groups were given verbal feedback from the research team after each attempt, and the no feedback group did not receive any form of feedback. At the start of the trials and after every 5th attempt, each participant was asked to give feedback on how confident (self-efficacy) they were that they could master the movement. Upon finishing, the research team determined at what trial, if at all, mastery was met from each individual. Data was collected and analyzed using the video tripod, the research team, and the previous data collected from each individual.

Results and Discussion

A total of 18 subjects (9 male and 9 female) participated in the study. Six (6) subjects were assigned to each type of feedback group.

Self-Efficacy

Self-Efficacy was evaluated by the following question: "How confident do you feel (0-100%) that you will master the sidekick movement within the 20 trials?" All feedback groups increased confidence with the auditory group increasing the most (18%) and the no feedback group increasing the least (8%). The auditory feedback group was the least confident at the end of 20 trials, possibly due to having many critiques over the span of 20 trials. The visual group was the most confident after 20 trials. Both genders increased confidence over 20 trials with males increasing by 7% and females increasing by 18%.

Average percent confidence (0-100%) by gender (pre to post)

- Males: 77% - 84%
- Females: 74%-92%

From the pre-test to the final efficacy test, entire group percentage increased significantly

- Pre-test mean= 75.94%
- Post test mean= 88.28%
- P=.021

Mastery

Only 7 subjects achieved mastery (5 subjects auditory and 2 subjects visual). No subjects achieved mastery from the no feedback group.

Qualitative Results

Most visual feedback participants weren't watching themselves in the mirror and need to be reminded that they should view themselves while performing the movement. Some participants mastered the movement and then plateaued and regressed. This happened in all three feedback groups.

Corrections and Human Errors

- Tell volunteers what to wear- no baggy or too restrictive clothes
- Use an easier skill- more people need to be able to reach mastery
- Cue visual feedback to use mirror
- Use positive language critiques; "what to do"
- Ask: "Do you consider yourself a better visual or auditory learner?"