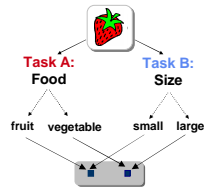


Introduction

Although executive functions can be improved by training, little is known about the extent to which these training-related benefits can be transferred to other tasks, or whether this transfer can be modulated by the type of training in different age groups. The aim of this study was to investigate age differences in the transfer of task-switching training across the lifespan. We examined near transfer to structurally similar switching tasks and far transfer to structurally dissimilar executive tasks (such as the Stroop task and working-memory), and to another task domain (fluid intelligence). In addition, we assessed whether transfer can be promoted by the type of training, that is, by means of variable task-switching training (i.e., different tasks in each training session) or the use of verbal self-instructions.

Method

Tasks and Measures



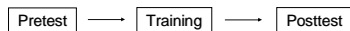
Single-task Blocks:
AAAAAA ...
BBBBBB ...

Mixed-task Blocks:
AABBAABBAA

Mixing Costs =
Mixed-task Blocks –
Single-task Blocks

Alternating runs paradigm = no external task cues!

Procedure & Experimental Conditions



- Single Tasks (A and B)
 - Task Switching (A and B)
 - Cognitive Battery
- 4 Sessions
- Single Tasks (A and B)
 - Task Switching (A and B)
 - Cognitive Battery

Transfer: Posttest vs. Pretest

4 Different Training Groups:

- 1) Single-Task Training (Tasks C and D)
- 2) Task-Switching Training (Tasks C and D)
- 3) Task-Switching + Verbal Self-Instruction Training (verbalizing the next task goal during task preparation)
- 4) Task-Switching + Verbal Self-Instruction Training + Variable Training Tasks

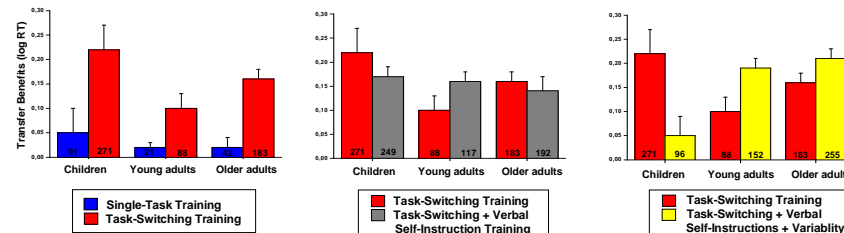
Sample

	Children		Young Adults		Older Adults	
	M	SD	M	SD	M	SD
N	56		56		56	
Mean age	9.3	0.6	22.4	2.2	68.7	2.9

Results

Near Transfer of Task-Switching Training

Transfer Benefits on the Level of Mixing Costs (i.e., the reduction of mixing costs from pretest to posttest)

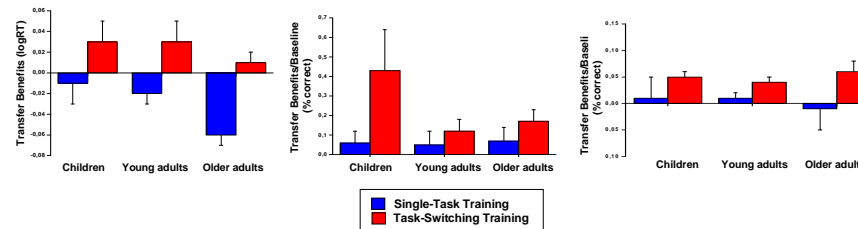


Far Transfer of Task-Switching Training

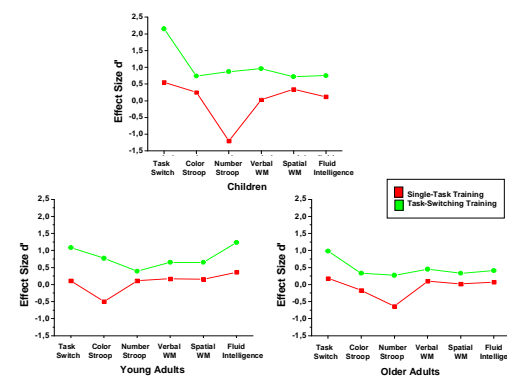
Transfer Benefits on the Level of Stroop Interference (i.e., reduction of interference from pretest to posttest)

Transfer Benefits for Working Memory (i.e., performance improvement from pretest to posttest)

Transfer Benefits for Fluid Intelligence (i.e., performance improvement from pretest to posttest)

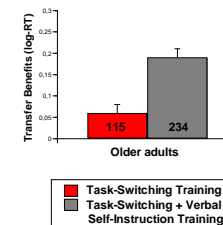


Effect Sizes for Near and Far Transfer



Transfer of Verbal Self-Instruction Training (Control Experiment)

Are verbal self-instruction benefits transferable to untrained switching tasks when participants continue applying the verbal training strategy at posttest (i.e., when training and transfer situations are more similar)?



Summary

- (1) All age groups show near transfer of task-switching training to a structurally similar switching task at posttest (i.e., a larger reduction of mixing costs from pre- to posttest after task-switching training than after single-task training). This near transfer is most pronounced for children and older adults.
- (2) There is no near transfer of the verbal self-instruction benefits to a structurally similar switching task after training. However, when the verbal strategy is not only applied during training, but also at posttest, older adults are able to transfer the verbalization-related training benefits to a new, similar task (control experiment).
- (3) Training variability increases the transfer of task-switching training in both young and older adults, but impairs it in children.
- (4) All age groups show far transfer from task-switching training to other 'executive' tasks, that is, to interference control in the Stroop task and to working memory abilities.
- (5) All age groups show far transfer from task-switching training to another task domain, namely fluid intelligence.

Conclusion

Thus, task-switching training resulted in the transfer of relatively general executive control abilities, such as goal maintenance, task-set selection, and the inhibition of task-irrelevant information. These findings suggest that the extensive training applied in this study yielded transfer of global, higher-level cognitive control processes and not of lower-level task-specific processes, pointing to its relevance for a number of clinical and educational applications.