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Self-controlled Practice of Decision-making Skills

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Introduction

⇒ The effectiveness of practice regimes that contain some form of self-control by the learner has been intensely discussed in the cognitive learning domain for a number of years (e.g., Zimmerman & Schunk, 2001).

⇒ More recently, researchers have also begun to examine the effect of self-control on motor skill learning. In these studies one group of learners has (self-) control over a certain aspect of the practice situation [SC], whereas another group does not [Yoked].

⇒ The results consistently demonstrate that giving learners control over the practice situation has a beneficial effect on the learning of simple and complex motor skills (see TABLE 1). However, this "self-control effect" occurs with a delay, that is, it can be found only in the retention tests.

⇒ Self-controlled practice schedules have not yet been used for the study of decision-making processes. Furthermore, the role of the performers' skill level is still unknown.

⇒ Thus, the purpose of this study was to compare the effectiveness of self-controlled versus externally (i.e. yoked) controlled practice with regard to the acquisition, retention and transfer of a cognitive decision-making skill within the scope of the expert-novice paradigm.

TABLE 1. Results of studies of self-controlled practice

Study	Advantage of SC over Yoked?	
	Acquisition	Retention
Titzer, Shea & Romack (1993)	Yes	Yes
Chen, Hendrick & Lidor (1993)	No	Yes
Janelle, Kim & Singer (1995)	No	Yes
Janelle et al. (1997)	No	Yes
Wiemeyer (1997)	No	No
Wulf & Toole (1999)	No	Yes
Wulf et al. (2001)	No	Yes
Chiviakowsky & Wulf (2002)	No	No
Wrisberg & Pein (2002)	No	Yes
Bund & Wiemeyer (2004)	No	Yes
Wulf, Raupach & Pfeiffer (2005)	No	Yes

Method

⇒ Participants
N = 48 university students (26 men, 22 women; M = 22.5 years) participated in the experiment. They were relatively unfamiliar with the experimental task (Tic-Tac-Toe Game). Participants werde randomly assigned to one of four treatment groups with the restriction that each self-control participant was paired with a yoked participant of the same skill level and sex.

⇒ Task and dependent variables
The experimental task was to play the Tic-Tac-Toe Game with 4x4 fields (see FIGURE 1). The game was computer-programmed and presented on a PC. As dependent variables were assessed game success (winning games) and mean decision-making time.

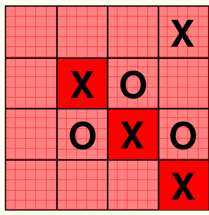

FIGURE 1. Tic-Tac-Toe

⇒ Study Design / Groups
The 2 (Control: Self vs. Yoked) x 2 (Skill level: Novices vs. Experts) design of the study led to four groups. Participants in the self-control groups practiced Tic-Tac-Toe during the treatment phase in a self-paced schedule, whereas participants in the yoked groups were given the schedules of their self-control counterparts.

⇒ Procedure
To become experts, participants in the expert groups played 8 x 20 games before the beginning of the experiment. The experimental session consisted of a pre- and posttest and a treatment phase (day 1) as well as a retention and transfer test (day 2) (see FIGURE 2).

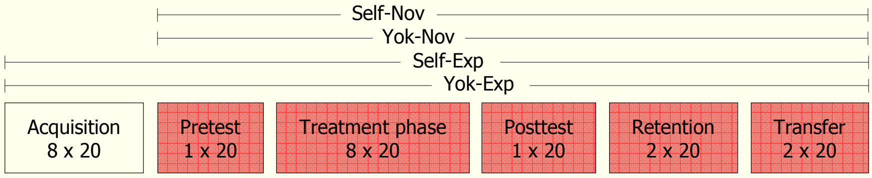

FIGURE 2. Experimental procedure

Results and discussion

⇒ Pretest
The expert groups won more games and demonstrated shorter decision-making times than the novice groups, $F_{(1,44)} = 39.0$; $p < .001$, $\varepsilon = 0.94$, and $F_{(1,44)} = 4.6$; $p < .05$, $\varepsilon = 0.32$.

⇒ Treatment phase
All groups increased the number of winning games during the treatment, $F_{(7,308)} = 8.2$; $p < .001$, $\varepsilon = 0.43$. More important, the yoked groups had more winning games than the self-control groups, $F_{(1,44)} = 6.4$; $p < .05$, $\varepsilon = 0.38$, and the expert groups outperformed the novice groups, $F_{(1,44)} = 6.6$; $p < .05$, $\varepsilon = 0.39$. All groups reduced their decision-making times, $F_{(7,308)} = 7.9$; $p < .001$, $\varepsilon = 0.42$. Again, the yoked participants showed clearly lower decision-making times than their self-control counterparts, $F_{(1,44)} = 14.2$; $p < .001$, $\varepsilon = 0.57$, and the experts played faster than the novices, $F_{(1,44)} = 15.8$; $p < .001$, $\varepsilon = 0.60$.

⇒ Posttest
The experts won more games compared to the novices, $F_{(1,44)} = 5.9$; $p < .05$, $\varepsilon = 0.37$, whereas the yoked participants had lower decision-making times than the self-control participants, $F_{(1,44)} = 8.1$; $p < .01$, $\varepsilon = 0.43$.

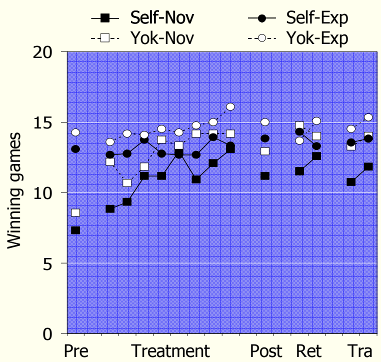

Figure 3.
Scores for game success

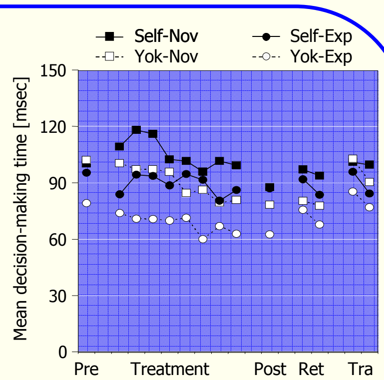

Figure 4.
Scores for decision-making time

⇒ Retention
Relating to game success, there were no significant differences between the groups (all $p > .1$). However, participants in the yoked groups again needed less time to make their game decisions than the self-control participants, $F_{(1,44)} = 10.1$; $p < .01$, $\varepsilon = 0.48$.

⇒ Transfer
The yoked groups were still more successful in winning games than the self-control groups, $F_{(1,44)} = 4.8$; $p < .05$, $\varepsilon = 0.33$; at the same time, experts performed better than novices, $F_{(1,44)} = 5.1$; $p < .05$, $\varepsilon = 1.15$. In addition, experts had shorter decision-making times than novices, $F_{(1,44)} = 7.4$; $p < .01$, $\varepsilon = 0.41$.

⇒ Overall, the present findings do *not* confirm the results of self-controlled practice in the field of motor learning (see TABLE 1). In contrast, a negative "self-control effect" was found. Thus, it seems that self-control regimes are beneficial for learning motor skills, but detrimental for the acquisition of decision-making skills.

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