

Cognitive Effects of Chess Instruction on Students At Risk for Academic Failure

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Abstract: This study examined the cognitive effects of chess instruction on thirty-eight students at risk for academic failure. The analysis found no significant differences between the cognitive changes registered by the treatment group and the control group. However, for the chess group, participant chess rating was significantly correlated with TONI-3 scores. The findings indicated that student acquisition of high chess ratings contributes to the improvement of cognitive skills rather than student mere exposure to chess.

Introduction

Chess playing provides numerous opportunities for players to practice higher order cognitive skills. It involves comprehension of chess positions, analysis of moves and their sequences, and evaluation of positions resulting from certain moves (Bart, 2004; Gobet & Simon, 1996). Higher order cognitive skills play a major role in enabling students to better establish and attain goals, identify potential response alternatives in the decision-making process, and achieve self-regulated learning (Wehmeyer, Palmer, Agran, Mithaug, & Martin, 2000). These skills are considered to be transferable skills (Ericsson & Staszewski, 1989; Ericsson & Kintsch, 1995; Gobet & Simon, 1996).

Although little research has been conducted to identify the effect of chess, chess instruction shows that it produces significant effects on student performance in both cognitive and academic tasks. Horgan's (1987) study was the first study in providing a model for chess instruction, emphasizing teaching of principles, frequent feedback, and specific chess drills. Research on chess instruction demonstrates that children who play chess improve analytical reasoning, problem solving skills, and even academic achievement (Chrisiaen & Verholfstadt, 1978; Frank & D'Hondt, 1979; Smith & Cage, 2000), while studies on the relation between visuospatial ability and chess skill showed mixed results (Waters, Gobet, & Leyden, 2002).

But can chess instruction have salutary cognitive effects with other types of students such as students at risk or students with disabilities? Storey (2000) suggested that chess instruction could also benefit children with disabilities, even though only anecdotal evidence is available for the effect of chess play on students with disabilities (Remsen, 1998; Russo, 1997; Wojcio, 1995). Thus, this study will examine this issue as it concerns various kinds of students who are at risk for academic failure. A relation between chess skill and higher order cognitive skills will be investigated to support a model that chess instruction benefits students at risk.

Methods

Participants

Thirty-eight students, ages 8 to 12, from three elementary schools participated. These schools are located in Seoul, Korea. Of these students, all students enrolled in an after school program for students at risk. Among them, six students received special education services at a resource room setting, too. Students at risk were identified according to criteria developed by the Korean Ministry of Education.

They possessed poor math, reading, and writing skills. Approximately 2-3% of students per school fell into this category. They have significant deficits in more than one area among the domains of reading, writing, and math. Playing chess was new to most of the students. Although one student stated that he sometimes played chess with his brother and his knowledge of basic chess rules was shallow.

Procedures

The study began with administration of the two pretests after the consent forms were returned. A researcher and a research assistant administered tests in the first week of this study. At the beginning and end of the chess intervention, Test of Nonverbal Intelligence, Third Edition, (TONI-3) and Raven's Progressive Matrices (RPM) were given to the students.

The participants were randomly assigned to an experimental (18) or a control group (20). The experimental group received a 90-minute chess lesson once per week and the control group students attended regular school activities after class.

A chess intervention was divided into 12 separate lessons over a 3-month period. Each lesson consisted of three segments: reviewing, lecturing, and chess playing. A chess instructor provided a set of quizzes after each lecture. The last six lessons were implemented in a computer lab by using chess software.

Results

The results of this study indicate no cognitive effect of chess instruction. In the analysis of two cognitive tests, the experimental group performance on the test was not different from the control group performance.

For internal analysis of the experimental group, the partial correlation of the TONI-3 Posttest scores and the Chess Ratings with the TONI-3 Pretest score being held constant was .520, $p < .05$. However, the effect size for the experimental group was small ($d = 0.29$) on TONI-3.

Discussion

Although there are a few limitations, the results of this study demonstrate that young novice chess players at risk for academic failure can benefit from chess instruction through improving their chess skills. They require more time for chess instruction than a twelve-session chess instruction period. One year or more of chess instruction is suggested for strong salutary cognitive effects on the students at risk.

In addition, chess instruction should focus on student acquisition of higher chess skill ratings rather than mere exposure to chess. If the chess instruction focused on improvements in student chess skill ratings through practicing higher order cognitive skills, then the chess instruction might well engender salutary cognitive effects. For the development of chess instruction, individual differences and unique needs should be taken consideration.

Thus, we recommend that the cognitive effects of chess performance on students at risk for academic failure continue to be studied. The heretofore-mentioned methods for improving chess instruction could be incorporated into such an inquiry. Chess instruction specially configured may prove to be very efficacious in producing salutary cognitive effects among students at risk for academic failure in the USA, and elsewhere in the world.

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