

THINKING OUT OF THE BOX, ENHANCING CREATIVITY AND DIVERGENT THINKING THROUGH CHESS TRAINING

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Abstract: Creativity is the tendency to create or recognize ideas, alternatives, or possibilities that may be useful in solving problems. It is the ability to produce work that is both novel (i.e., original, unexpected) and appropriate (i.e., adaptive concerning task constraints). This study analyzed the effect of 2-year chess training program on the creativity of school-going children. A pretest–posttest with control group design was used. The training methodology comprised Winning Moves Chess Learning Program with the demonstration board, on-the-board playing and training, chess exercise through workbooks, and working with chess software, which was carried out by trained chess coaches. Analysis of Covariance (ANCOVA) revealed that there was a statistically significant increase in Total Creativity observed in the experimental group compared to the control group after 2-year chess intervention and the effect size was small as assessed by Cohen’s d. It is clear that the outcome of this rigorous, yet enjoyable, training methodology was the enhanced cognitive abilities that were reflected in increased creativity scores. Improving creativity through chess intervention could lead to enhanced functioning. These increases have far-reaching benefits for academic performance and generally for life skills. Therefore, the potential educational gains of chess interventions are valuable and should be explored.

Keywords: Chess. Creativity. Cognition.

Resumo: Criatividade é a tendência de criar ou reconhecer ideias, alternativas ou possibilidades que podem ser úteis na resolução de problemas. É a capacidade de produzir um trabalho que é novo (ou seja, original ou inesperado) e apropriado (ou seja, adaptável às restrições da tarefa). Este estudo analisou o efeito de um programa de treinamento de xadrez de 2 anos sobre o criatividade de crianças em idade escolar. Foi feito um pré-teste, seguido de pós-teste com grupo de controle. A metodologia de treinamento compreendeu o Programa de Aprendizagem de Xadrez de Jogadas Vencedoras com um tabuleiro de demonstração, jogo e treinamento no tabuleiro, exercícios de xadrez por meio de livros de exercícios, e trabalhos com software de xadrez, que eram realizados por treinadores de xadrez. A análise de covariância (ANCOVA) revelou que houve um aumento estatístico significativo na criatividade total observada no grupo experimental, em comparação com o grupo de controle, após uma intervenção de xadrez de 2 anos. O tamanho do efeito foi pequeno, como avaliado pelo d de Cohen. Ficou claro que o resultado desta metodologia de treinamento, rigorosa, mas agradável, foi o aprimoramento das habilidades cognitivas que se refletiram no aumento da pontuação em criatividade. Melhorar a criatividade por meio de intervenção com xadrez pode dar bons resultados. Esses aumentos trazem benefícios de longo alcance para o desempenho acadêmico e geralmente para habilidades úteis na vida. Portanto, os potenciais ganhos educacionais com intervenções de xadrez são valiosos e devem ser explorados.

Palavras-chave: Xadrez. Criatividade. Conhecimento.

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1. INTRODUCTION

Creativity is defined as the tendency to generate or recognize ideas, alternatives, or possibilities that may be useful in solving problems, communicating with others, and entertaining ourselves and others (FRANKEN, 1982). Typically creativity is defined as “the ability to produce work that is both novel (i.e. original, unexpected) and appropriate (i.e. adaptive concerning task constraints)” (STERNBERG, 1999). These definitions emphasize the concept of both fluency and novelty in the responses that have been generated.

The creative process involves a number of components, most commonly:

1. Imagination
2. Originality (the ability to come up with new and original ideas and products)
3. Productivity (the ability to generate a variety of ideas through divergent thinking)
4. Problem solving (application of knowledge and imagination to a given situation)
5. The ability to produce an outcome of value and worth

A creative or divergent thinker is described as the person who pushes the boundaries of ability and knowledge and is able to reconsider the problem to find different perspectives and solutions and ignore distractions that can negatively affect his or her productivity (SACCARDI, 2014). Creativity among children emerges gradually between grades 1 and 3 (TORRANCE, 1964). In general, the broad and complex multidimensional concepts of creativity can be measured by Torrance Tests of Creative Thinking (TTCT; TORRANCE, 1964, 1990a, 1990b) and the Wallach–Kogan Creativity Test (WKCT; WALLACH & KOGAN, 1965).

There is a fairly common belief that creativity can be developed through training. Various recent studies that have assessed the effects of programs for stimulating creativity confirm this belief (ANTONIETTI, 2000; FLEITH, RENZULLI, & WESTBERG, 2002; KOMARIK & BRUTENICOVA, 2003; SAXON, TREFFINGER, YOUNG, & WITTIG, 2003). Consequently, many countries are increasingly placing a high priority on stimulating creative thinking at the school level.

Since chess helps in developing strategic thinking and problem-solving skills of children, it may also be effective in improving their cognitive skills (SIGIRTMAC, 2016). Chess builds problem-solving abilities, enhances strategic thinking skills, and even improves self-esteem as well as higher-order thinking skills, which are known as meta-cognitive skills. In countries where chess is intensively played by students, students who practice chess are among the toppers in mathematics and science as they are able to recognize complicated patterns (MILAT, 1997).

While a number of other models of creativity have brought out the steps involved in the creative process, Avni (1998) posited a four-step model specific to chess playing. According to him, an intelligent process in playing chess consists of four different steps: synthesis (opinion forming and plan shaping), gathering (collecting the raw materials during position evaluation), enlightenment (a sudden observation of an idea), and realization (translating the idea into practical lines of play). Thus, these four steps can be used for a creative process that could also work in some other areas (BUSHINSKY, 2009).

In India, there are only a few studies on chess as a strategy to increase cognitive abilities. Further there are no studies assessing the impact of chess intervention on the creativity of children. If research can establish that creativity can be facilitated by playing chess, it can significantly impact educational programs to increase creative thinking.

The objective of the study was, therefore, to analyze the effect of 2-year chess training program on the creativity of school-going children of both genders. It was hypothesized that chess training would significantly increase creativity in children.

2. METHODOLOGY

The research design used for the study was pretest and posttest with control group design. The independent variable was the Chess training program, and the dependent variable was Creativity of children. The sample was selected from four schools, two government schools

and two private schools, using random sampling and consisted of children of both genders in the age range of 6 to 16 years (grade 6-9). It consisted of 99 children, 50 in the experimental group and 49 in the control group. During the time of chess intervention for the experimental group, the control group children were engaged in extracurricular activities offered in school such as cricket, football, and hockey.

2.1 Tools

Creativity was assessed by Indian adaption of WKCT. The WKCT (WALLACH & KOGAN, 1965) is similar to the TTCT in that it focuses on divergent thinking and assesses both visual and verbal content. It includes three verbal subtests—Instances (e.g., name all the round things you can think of), Alternative Uses (e.g., for a newspaper), and Similarities (e.g., How are a cat and mouse similar?)—and two figural subtests—Pattern Meanings and Line Meanings (interpreting abstract patterns and lines). It is scored for fluency (number of ideas) and uniqueness (ideas not offered by others in the group being tested). Wallach and Kogan's (1965) major contribution were their belief that standardized test procedures were not conducive to creative performance and their insistence on a more relaxed and game-like atmosphere. The test is given individually, and no time limits are imposed. However, in the present administration, a time limit of 3 minutes was given for each subtest. The number of valid responses for each subtest was summed to obtain the subtest totals. The total creativity scores comprised the sum of the subtest scores.

2.2 Chess Training Methodology

The children were grouped into small clusters based on the chess ability and were trained for an hour starting from the basics. The training methodology comprised Winning Moves Chess Learning Program (JOSEPH, 2008) Episodes 1–22, lectures with the demonstration board, on-the-board playing and training, chess exercise through workbooks (Chess School 1A, Chess

School 2, and tactics), and working with chess software. Further, students' games were mapped and analyzed using score sheets and Chess software. The children were taught the ideas behind chess openings, and exposure to classical games was also given. The children participated in mock as well as regular tournaments. On an average, the children underwent 1 hour per week chess intervention for about 2 years. One coach was assigned for eight students.

3. PROCEDURE

Informed consent was obtained before the children were included in the study. Assessment of intelligence was done by certified psychologists who were blind as to whether the child belonged to the experimental or control group. The time taken for each IQ assessment ranged from 45 to 90 minutes. Preassessment was done prior to starting the chess training module. Postassessment was carried after an average of 1-year duration and follow-up assessment after 2 years. Clustering technique was used to form the training groups of six to eight children. The chess training consisted of once-a-week chess classes conducted for 1 hour during school hours at the end of the day.

Chess Training Intervention was started and was carried out by professional trainers over a period of 2 years. Each chess session duration was about 1 hour and about 25–30 chess learning sessions were administered for each student of the experimental group, while the students in the control group were actively involved in other activities such as football, cricket, tennikoit, music, arts, and crafts.

4. RESULTS

Tables 1–3 indicate that there was a significant effect of intervention on total creativity at post-second-year intervention ($p < 0.05$). Table 1 shows that the mean of the total creativity increased in the experimental group from 48.59 to 58.84 following intervention, compared to the

control group, which increased from 45.9 to 51.52. Table 4 indicated that creativity had small effect size as assessed by Cohen's d.

Table 1 - Descriptive statistics for creativity

Creativity	Experimental	Control
Pre	48.59	45.9
Post First Year	58.84	51.52
Post Second Year	72.45	62.54

Table 2 - ANCOVA between intervention group and control group on total creativity post-first-year intervention

Sources of Variance	Sum of Squares	Degrees of freedom (dF)	Mean Square	F statistic	Significance.
Corrected Model	13913.765	2	6956.883	50.948	0.000
Intercept	5326.791	1	5326.791	39.011	0.000
Pre-Total Creativity	12950.61	1	12950.61	94.843	0.000
Exp Con	728.417	1	728.417	5.335	0.023*
Error	16112.62	118	136.548		
Total	397593	121			
Corrected Total	30026.38	120			

*p<0.05.

Table 3 - ANCOVA between intervention group and control group on total creativity post-second-year intervention

Source	Type III Sum of Squares	Degrees of freedom (dF)	Mean Square	F statistic	Significance.
Corrected Model	15155.323 ^a	5	3031.065	10.998	.000
Intercept	6790.510	1	6790.510	24.638	.000
Pre-Total	1655.888	1	1655.888	6.008	.016
Mid Total	582.493	1	582.493	2.113	.150
Experimental Control	382.346	1	382.346	1.387	.242
Type of School	1073.073	1	1073.073	3.893	.052
Experimental Control	1309.462	1	1309.462	4.751	.032*
Error	24253.454	88	275.607		
Total	469859.000	94			
Corrected Total	39408.777	93			

*p < 0.05.

Table 4 - Cohen's *d* effect size

Variable	N1	N2	m ₁	m ₂	s ₁	s ₂	Cohen's <i>d</i>	Effect Size
Creativity	56	53	56.071	54.604	17.96	15389	0.086482	Small

5. DISCUSSION

It can be inferred from the ANCOVA results that there is a significant gain in creativity among the children in the intervention group compared to the control group (Tables 1–3) This is in line with other studies conducted by Joseph, Easvaradoss, Abraham, Brazil, and Chandran (2017) and Sigirtmac (2016), who found that children from the intervention group scored significantly higher than those from the control group in creativity. As research has clearly established, chess is a game that stimulates cognitive processes and strengthens intellectual abilities and cognitive skills (ACIEGO, GARCÍA, & BETANCORT, 2012; BILALIC, MCLEOD, & GOBET, 2007; DE BRUIN, KOK, LEPPINK, & CAMP, 2014). Moreover, it has been shown that the intellectual gains have translated into increases in both intelligence quotient and academic scores (AYDIN, 2015; BARRETT & FISH, 2011; JOSEPH, EASVARADOSS, & SOLOMON, 2016; ROMANO, 2011).

In the present study, the children were taught chess systematically. They did not merely play chess but were strongly encouraged to challenge their own standards and also to play competitively. They analyzed their own games, identified their strengths, and understood their mistakes. They were also given opportunities to pit their skills against others as they played in tournaments. It is clear that the outcome of this rigorous, yet enjoyable training methodology was the enhanced cognitive abilities that were reflected in increased creativity scores. The child thinks beyond the usual solutions using divergent thinking, thinking abstractly, weighing options, evaluating outcomes, and making decisions. Insightful thinking also appears to play a role.

The intellectual strategies underlying chess playing have been spelt out by Avni (1998). According to him, chess playing involves an intelligent process that consists of four different steps: synthesis (opinion forming and plan shaping), gathering (collecting the raw materials during position evaluation), enlightenment (a sudden observation of an idea), and realization (translating the idea into practical lines of play). The child thinks beyond the usual solutions using divergent thinking, thinking abstractly, weighing options, evaluating outcomes, and making decisions. Insightful thinking also appears to play a role.

The WKCT, which was used in the present study, requires the child to think divergently, quickly, and fluently, generating as many responses as possible on the different tasks. It is evident that similar abilities are utilized in playing chess where innovativeness and accuracy and both broad-based and precise thinking are required. The experimental group, which had undergone 2-year training in chess, appears to have acquired these skills as indicated by a significant increase in overall creativity compared to the control group. Earlier studies have pointed to the positive impact that chess has had on academic scores, especially language and reasoning (Joseph Et Al., 2016). The components of creativity studied on the test are the ability to name objects that have common properties involving abstraction (Instances), to identify multiple uses for common objects involving divergent thinking (Alternate Uses), to perceive similarities between two different objects utilizing generalizing and abstraction (Similarities), to perceive meaning in meaningless stimuli involving innovativeness (Line Drawing), and to perceive meaning in structures and stimuli involving the ability to form association (Pattern Drawing). The game of chess uses primarily visuospatial strategies. Systematic chess training inculcates in the child the ability to think divergently, visualizing the pros and cons of the various chess moves.

Garaigordobil (2006) studied the impact of a play program on the verbal and graphic-figural creativity. Results showed a positive effect of the intervention, as the experimental participants significantly increased their verbal creativity and graphic-figural creativity. This research primarily focused on structured cooperative play. The chess intervention in the present study also has structural characteristics that corroborate the finding of other studies that had

indicated positive effects of play on the development of creativity. This structured quality helps the child to systematically visualize all the possible options and outcomes available to him or her. This ability, which has been acquired through chess training, has led to increased total creativity scores and increases on the visuospatial subtests.

6. IMPLICATIONS

Systematic chess training inculcates in the child the ability to think divergently, visualizing the pros and cons of the various chess moves. It is evident that systematic chess intervention increases creativity in children. The child who develops the ability to think in creative ways in playing chess is likely to transfer this learning to dealing with life challenges creatively.

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