
EFFECTS OF CREATIVE MOVEMENT ACTIVITIES BASED ON CREATIVE DANCE
CONCEPTS ON EXECUTIVE FUNCTION SKILLS OF UPPER ELEMENTARY
SCHOOL STUDENTS IN PHUKET PROVINCE

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Abstract

The purposes of this research were to: (1) study the effects of creative movement activities based on creative dance concepts on Executive Function (EF) skills of upper elementary school students in Phuket Province and (2) compare the effects of creative movement activities based on creative dance concepts on executive function skills between the experimental group and the control group. The sample consisted of 50 upper elementary school students in the 2023 academic year from Wichitsongkram School in Phuket Province. The samples were divided into two groups: 25 for experimental group and 25 for control group. The research duration was four weeks. The data were collected through tests. Data were analyzed using mean, standard deviation, and t-test. The research findings revealed that: (1) after the experiment, the experimental group had EF skills scores higher than those of before at .05 level of significance and (2) after the experiment, the experimental group had EF skills scores higher than those of the control group at .05 level of significance.

Keywords: Creative Movement, Creative Dance, Executive Function

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Introduction

Humans are not born with skills to handle external stimuli, planning processes, or the ability to focus on specific tasks. However, humans are born with the potential to develop these abilities-or may fail to develop them-depending on their experiences from infancy through childhood into adulthood (Center on the Developing Child at Harvard University, 2014). Childhood, particularly late childhood between ages 10-12 years, represents a critical period for motor development (Zinelabidine et al., 2022) and cognitive functions. One crucial skill for learning and development is Executive Function (EF), which involves frontal lobe operations that control and regulate emotions, thoughts, decision-making, and actions (Blair, 2016). These skills can be developed to varying degrees through cognitive processes and hands-on practice to achieve behavioral goals (Friedman & Miyake, 2017).

Cognitive abilities or brain functions play a crucial role in movement performance. This aligns with studies on motor development and sports performance (Belling & Ward, 2015; Vestberg et al., 2017). Achieving peak movement and sports performance is directly related to brain function or cognitive abilities. Literature review of research examining the relationship between EF skills and movement in children aged 6-15 years reveals that EF components - Working Memory, Inhibitory Control, and Cognitive Flexibility-have positive correlations with movement capabilities (Ziereis & Jansen, 2015; Chou et al., 2022).

Movement development during childhood serves as a foundation for developing quality and efficient daily life movement patterns in the future. It also constitutes a fundamental factor in developing sports skills, exercise abilities, and various physical activities. This enables individuals to participate in physical activities for health benefits, social relationships, and leisure enjoyment according to their individual preferences and opportunities.

Furthermore, movement development from childhood affects the ability to express basic physical movements and the capacity to develop motor skills, leading to changes in physical activity behaviors. This enables confident movement and control across various physical activities, along with appropriate responses to different situations (Whitehead, 2019). Physical activity is particularly crucial for children and youth, as sufficient physical activity promotes the development of motor skills, bone strength, physical fitness, and respiratory and circulatory system efficiency. Beyond physical health benefits, regular physical activity also promotes mental health and develops social skills, while enhancing cognitive function and learning capabilities (Aadland et al., 2017; Lochte et al., 2018).

Given the above context, promoting EF skills is crucial and essential, particularly for upper elementary school children aged 10-12 years, which is a critical period for both motor development and cognitive abilities (Zinelabidine et al., 2022). Therefore, the

researcher is interested in studying the effects of creative movement activities on EF skills among upper elementary school students in Phuket Province, aiming to develop their ability to regulate and control their thoughts, actions, emotions, and behaviors.

Objectives

1. Study the effects of creative movement activities based on creative dance concepts on executive function skills of upper elementary school students in Phuket Province.

2. Compare the effects of creative movement activities based on creative dance concepts on executive function skills between the experimental group and the control group.

Literature Review

Executive Function represents advanced thinking skills in humans, responsible for managing and regulating thoughts, emotions, and behaviors in various aspects, such as working memory, inhibitory control, cognitive flexibility, task initiation, planning, problem-solving, and self-monitoring. The prefrontal cortex controls these skills, coordinating their function and regulating other brain regions to enable successful task completion and goal achievement (Chutabhakdikul et al., 2017; Hanmethee, 2015; Clancy, 2016). These skills can be developed to varying degrees through cognitive processes and practical implementation to achieve behavioral goals (Friedman & Miyake, 2017; McClelland & Cameron, 2019; Gandotra et al., 2021; Contreras-Osorio et al., 2021).

Review of research related to executive function (Center on the Developing Child at Harvard University, 2014; Diamond, 2013; Zelazo, 2015; Blair, 2016; Nelson et al., 2016; Prager et al., 2016; Thibodeau et al., 2016; Saengsawang et al., 2016; Taschanchai & Chuthapisith, 2016; Duangbu & Sawangboon, 2021) identifies three core components: working memory, inhibitory control, and cognitive flexibility. These fundamental skills are crucial for developing other components. Working memory serves as the foundation for cognitive development, inhibitory control for behavioral regulation, and cognitive flexibility for emotional regulation (Jaiwang et al., 2019).

Regarding executive function evaluation, various validated and thoroughly examined measurement tools exist. Literature review (Saengsawang et al., 2016; Chutabhakdikul et al., 2017; Duangbu & Sawangboon, 2021) reveals that most evaluations use rating scales with varying numbers of items. Therefore, in this study, the researcher developed an analytic rubric rating scale to measure behaviors reflecting executive function skills of upper elementary school students individually within researcher-developed situations.

The Center on the Developing Child at Harvard University (2014) suggests that promoting executive function for elementary school students should involve increasingly complex activities with added challenges. Therefore, the researcher applied creative movement activities based on creative dance concepts to maximize promotional effectiveness. The researcher built upon the

academic knowledge synthesized by the Center on the Developing Child at Harvard University, implementing it practically through the application of these concepts in this research study.

Creative dance is a form of movement expression through dance utilizing space, time, energy, and body. It helps children express their thoughts and feelings through movement (Masturah et al., 2018). Dance can convey emotions, feelings, and communicate stories through bodily expression. Synthesis of literature and research related to creative dance concepts (Vessawasdi & Khayankij, 2015; Gilbert, 2015; Chatzopoulos et al., 2018; McGowan, 2018; Olga et al., 2018; Joung & Lee, 2019; Matias et al., 2020; Rudd et al., 2021) supports the application of these concepts in this study, through movement expression via dance, utilizing pathways and directions of movement from start to finish, according to speed and rhythm of movement, with varying degrees of weight and flow of movement from different body parts leading the motion.

Methodology

This study employed a quasi-experimental research design with the following methodology:

Population and Sample

The population consisted of upper elementary school students in Phuket Province during the 2023 academic year, under the Office of Basic Education Commission (OBEC). The sample size was determined using G*Power program (Faul et al., 2009),

based on Cohen's sample size table (Cohen, 1988), with an alpha level of .05, effect size of .80, and power of the test at .80, resulting in 21 participants per group. To increase test power and compensate for potential sample attrition, the researcher planned to increase the sample size to 25 participants per group. The research sample consisted of 50 upper elementary school students from Wichitsongkram School in Phuket Province. Simple random sampling was used to select one grade level from three available grades (Grades 4-6), resulting in the selection of Grade 5 students. The sample was divided into two groups: an experimental group ($n = 25$) and a control group ($n = 25$) using matched subject technique. A t-test was conducted to verify that there were no significant differences in EF skills between the two groups before the experiment.

Research Instruments

The research instruments were creative movement activity plans based on creative dance concepts and an EF skills evaluation form for upper elementary school students in Phuket Province.

1. Creative movement activity plans based on creative dance concepts, consisting of four activities: 1) Emoji Dance, 2) High Five Dance, 3) The Animal Dance, and 4) Festival of Dance. Activities were conducted over four weeks, three times per week, 50 minutes per session. The development and quality assessment process consisted of the following steps:

1.1 Study of theoretical concepts and related research on EF skills, including collecting data on components of EF skills, assessment of EF skills, and theoretical concepts regarding the promotion of EF skills, specifically creative movement activities based on creative dance concepts, as well as relevant research.

1.2 Analysis and synthesis of creative movement activities based on creative dance concepts and research related to promoting EF skills to develop creative movement activity plans based on creative dance concepts for upper elementary school students in Phuket Province.

1.3 Development of creative movement activity plans based on creative dance concepts for upper elementary school students in Phuket Province, with each activity consisting of the following components: activity name, objectives, concepts, procedural steps, materials/equipment, precautions, and evaluation.

1.4 Quality assessment of the developed creative movement activity plans based on creative dance concepts for upper elementary school students in Phuket Province by submitting the developed activities to five experts. The experts' qualifications included knowledge and expertise in physical education or related fields, with a minimum educational qualification of a master's degree. The purpose was to evaluate the appropriateness of the program before implementation. The evaluation results indicated that the developed program was most appropriate.

2. The EF skills evaluation form for upper elementary school students in Phuket Province measured three core components: 1) working memory, 2) inhibitory control, and 3) cognitive flexibility. The development and quality assessment process consisted of the following steps:

2.1 Study of documents and research related to EF skills assessment tools to analyze and synthesize components, formats, and characteristics of questions according to the components of EF skills.

2.2 Determination of the assessment tool structure and formulation of questions. The structure of the assessment tool consisted of EF skills components, operational definitions, and number of items.

2.3 The quality of these activity plans was evaluated by three experts, who rated them as most appropriate, indicating that the developed plans were effective and could potentially promote EF skills among upper elementary school students in Phuket Province.

2.4 The EF skills evaluation form for upper elementary school students in Phuket Province measured three core components: 1) working memory, 2) inhibitory control, and 3) cognitive flexibility. Content validity was examined through the Index of Item-Objective Congruence (IOC), yielding an overall consistency index of 0.90. Reliability was tested using Cronbach's Alpha Coefficient, resulting in a reliability coefficient of 0.80. The evaluation form used a 5-level analytic rubric scale, with scoring criteria adapted from

Nitko (1996), as follows: For Working Memory component: 5 points: Student demonstrates behavior independently without assistance or prompting, 4 points: Student demonstrates behavior with one prompt or assistance, 3 points: Student demonstrates behavior with two prompts or assistance, 2 points: Student demonstrates behavior with three or more prompts or assistance, 1 point: Student shows no behavior despite assistance or prompting. For Inhibitory Control and Cognitive Flexibility components: 5 points: Highest level of behavior demonstration, 4 points: High level of behavior demonstration, 3 points: Moderate level of behavior demonstration, 2 points: Low level of behavior demonstration, 1 point: Lowest level of behavior demonstration. Score interpretation criteria: Less than 36 points or < 60% of total score: Needs improvement, 36-47.99 points or $\geq 60\% - < 80\%$ of total score: Satisfactory, 48-60 points or $\geq 80\%$ of total score: Excellent.

Data Collection

The researcher measured the EF skills of students in both the experimental and control groups before implementing the activities. Subsequently, the developed creative movement activity plans based on creative dance concepts were conducted during after-school hours from 15:30-16:20, three times per week (Monday, Wednesday,

and Friday), 50 minutes per session, for a total of 4 weeks. After the 4-week implementation of the developed activities, the EF skills of students in both the experimental and control groups were measured again.

Data Analysis

1. Comparison of mean differences in EF skills scores between pre-test and post-test within both experimental and control groups using Dependent-Sample t-test at .05 significance level
2. Comparison of mean differences in EF skills scores between experimental and control groups at post-test using Independent-Sample t-test at .05 significance level

Results

The Results of the Comparison of the Mean Scores of EF Skills of the Experimental Group and Control Group before and after the Experiment

The researcher compared mean EF skills scores between experimental and control groups at pre-test and post-test, categorized by components. The experimental group's mean EF skills scores after participating in the activities were significantly higher than pre-test scores at the .05 level. The pre-test mean score was 27.40 (needs improvement level), while the post-test mean score increased to 51.15 (excellent level), as shown in Table 1

Table 1 Comparison of the Mean Scores of EF Skills of the Experimental Group before and after the Experiment

Executive Function Skills	Experimental Group (n = 25)				t	p
	Pre-test		Post-test			
	M	SD	M	SD		
1. Working Memory	9.12	0.85	17.00	0.72	-70.68	0.00*
2. Inhibitory Control	9.25	0.99	17.12	0.90	-54.67	0.00*
3. Cognitive Flexibility	9.03	0.91	17.03	0.91	-74.37	0.00*
Overall	27.40	2.44	51.15	2.25	-190.40	0.00*

* $p < .05$

The mean EF skills scores of the control group showed no significant difference at the .05 level between pre-test and post-test. When examining the EF skills components for the control group at both pre-test and

post-test, no significant differences at the .05 level were found in the mean scores for Working Memory, Inhibitory Control, and Cognitive Flexibility, as shown in Table 2.

Table 2 Comparison of the Mean Scores of EF Skills of the Control Group before and after the Experiment

Executive Function Skills	Control Group (n = 25)				t	p
	Pre-test		Post-test			
	M	SD	M	SD		
1. Working Memory	9.13	0.93	9.06	0.86	0.50	0.71
2. Inhibitory Control	9.27	1.02	9.23	1.05	0.57	0.77
3. Cognitive Flexibility	9.16	1.03	9.19	0.94	0.00	1.00
Overall	27.56	2.72	27.48	2.64	0.60	0.52

The Results of the Comparison of the Mean Scores of EF Skills of the Experimental Group and Control Group

There was a significant difference at the .05 level in overall mean EF skills scores between the experimental and control groups

at post-test. When analyzing by EF skills components, significant differences at the .05 level were found in Working Memory, Inhibitory Control, and Cognitive Flexibility scores, as shown in Table 3.

Table 3 Comparison of the Mean Scores of EF Skills of the Experimental and Control Group

Executive Function Skills	Post-test				t	p
	Experimental Group		Control Group			
	M	SD	M	SD		
1. Working Memory	17.00	0.72	9.06	0.86	32.03	0.00*
2. Inhibitory Control	17.12	0.90	9.23	1.05	26.15	0.00*
3. Cognitive Flexibility	17.03	0.91	9.19	0.94	27.13	0.00*
Overall	51.15	2.25	27.48	2.64	31.25	0.00*

* $p < .05$

Discussion

The creative movement activity plans based on creative dance concepts consisted of four activities: 1) Emoji Dance, 2) High Five Dance, 3) The Animal Dance, and 4) Festival of Dance. These activities were conducted over 4 weeks, three times per week, 50 minutes per session, affecting three EF components: 1) Working Memory, 2) Inhibitory Control, and 3) Cognitive Flexibility. Working Memory involved short-term information retention during activities, including goals, procedural steps, and crucial information needed for successful task completion. This aligns with the key principles of creative dance concepts outlined by Gilbert (2015), who stated that creative dance promotes sequential movement, transitioning from one action to another. Likewise, Hanmethee (2015), Clancy (2016), Chutabhakdikul et al. (2017) confirmed that EF represents advanced thinking skills in humans, responsible for managing and regulating thoughts, emotions, and behaviors in various aspects, such as Working Memory, Inhibitory Control, Cognitive Flexibility, Task

Initiation, Planning, Problem-Solving, and Self-Monitoring. The prefrontal cortex controls these skills, coordinating their function and regulating other brain regions to enable successful task completion and goal achievement. This aligns with Taschanchai and Chuthapisith (2016), who concluded that activities requiring rule memorization help children practice short-term memory and enhance working memory. It also corresponds with Matias et al. (2020), who found that storytelling activities with sequential narration and dance movements, such as jumping, swimming, and ball passing gestures, improved Working Memory as children needed to remember character traits and expressions. Inhibitory control involves regulating one's movement activities against distractions, maintaining focus, thinking before acting, and exercising patience to achieve goals. This aligns with Taschanchai and Chuthapisith (2016), who noted that following established rules and waiting for one's turn promotes inhibitory control. Cognitive flexibility involved adapting to movement changes, accepting movement-

related problem-solving approaches, and collaboratively designing movement activities to achieve goals. These findings align with Zinelabidine et al. (2022), who studied the effects of a dance program on students' EF skills over 8 weeks (twice weekly, 45 minutes per session), demonstrating improvements in all three EF components. Similarly, research by Jaiwang et al. (2019) on the effects of creative dance activities on students' basic EF skills found that the experimental group's basic EF skills after participating in the activities were significantly higher than before participation at the .05 level. Furthermore, the experimental group's basic EF skills after participating in the activities were significantly higher than those of the control group at the .05 level.

EF Skills: Working Memory Component

For the working memory component, the experimental group's mean score increased from 9.12 (needs improvement level) at pre-test to 17.00 (excellent level) at post-test. This approach also aligns with McGowan (2018), who noted that creative dance involves exploring complex and diverse dance components, thus enhancing movement-related information retention. Furthermore, the findings correspond with Oppici et al. (2020), who studied the effects of dance on working memory and motor competence in elementary school students. Their research found that after the experiment, the high-knowledge group showed significantly improved working memory skills at the .01 level.

EF Skills: Inhibitory Control Component

For the inhibitory control component,

the experimental group's mean score increased from 9.25 (needs improvement level) at pre-test to 17.12 (excellent level) at post-test. This aligns with Gilbert's (2015) creative dance concepts, which emphasize promoting student group work through listening and idea exchange until they can control their body movements through dance to achieve goals successfully. The findings also correspond with Rudd et al. (2021), who studied the effects of dance choreography and creative dance on elementary students' EF skills and motor competence. Their research found that both the choreography and creative dance groups showed higher inhibitory control skills post-intervention. Each activity involved queuing for participation, requiring students to maintain focus during execution without being distracted by external stimuli. This applied during storytelling sessions and when performing movement and dance activities according to each activity's specific conditions and problem situations.

EF Skills: Cognitive Flexibility Component

For the cognitive flexibility component, the experimental group's mean score increased from 9.03 (needs improvement level) at pre-test to 17.03 (excellent level) at post-test. This aligns with Gilbert's (2015) creative dance concepts, which describe creative dance as planned choreography where students create their dance segments and spend time coordinating movements and performances with peers. The findings correspond with Jaiwang et al. (2019), who

studied the effects of creative dance activities on basic EF skills in early childhood. The research found that the experimental group's basic EF skills (working memory, inhibitory control, and cognitive flexibility) were significantly higher post-intervention than pre-intervention at the .05 level. Additionally, the experimental group's basic EF skills were significantly higher than the control group at the .05 level.

Conclusions

The effects of creative movement activities on EF skills among upper elementary school students in Phuket Province can be concluded as follows:

EF Skills: Working Memory Component

This improvement can be attributed to the creative movement activities based on creative dance concepts, which aimed to enhance students' ability to retain information during activities, remember set goals, recall sequential steps, and maintain important information necessary for successful task completion. The researcher implemented four activities to promote working memory: 1) Emoji Dance, 2) High Five Dance, 3) The Animal Dance, and 4) Festival of Dance. The researcher prompted students to state the rules for each activity's problem situation by asking, "Can you remember and tell me the rules we need to follow, one by one?" This encouraged students to recall essential information about activity execution.

EF Skills: Inhibitory Control Component

This improvement resulted from creative

movement activities based on creative dance concepts aimed at enabling students to control their activities against distractions, avoid interrupting others, and practice queuing and patience to achieve successful outcomes. The researcher implemented four activities to promote inhibitory control: 1) Emoji Dance, 2) High Five Dance, 3) The Animal Dance, and 4) Festival of Dance. The researcher used continuous storytelling that connected with previous narratives, encouraging students to listen to the whole story for each activity before asking questions. The researcher prompted this by saying, "I will tell you an exciting story. Please listen until the end, and afterward, you can ask any questions you may have". This approach helped prevent interruptions during activity explanations.

EF Skills: Cognitive Flexibility Component

This improvement resulted from creative movement activities based on creative dance concepts aimed at enabling students to adapt to activity changes, solve immediate problems, design activities collaboratively, and accept others' problem-solving approaches to achieve successful outcomes. The researcher implemented four activities to promote cognitive flexibility: 1) Emoji Dance, 2) High Five Dance, 3) The Animal Dance, and 4) Festival of Dance. The researcher incorporated body movement design through dance, using physical movements in treasure-hunting scenarios to create musical expressions, encouraging students to practice collaborative activity design.

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