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Taekwondo Training and Its Impact on Executive Function: An Experimental Study

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The study explored variations in executive skills—including behavioral regulation, organization, emotional regulation, time management, and planning—between Taekwondo practitioners and non-practitioners. It included thirty-two female university students from Cotton University in Guwahati, India, aged 15 to 24, with the sample evenly divided into sixteen Taekwondo practitioners and sixteen non-practitioners. The study involved thirty-two female university students from Cotton University in Guwahati, India, aged 15 to 24, divided equally between sixteen Taekwondo practitioners and sixteen non-practitioners. Data were gathered using a 25-item executive skills questionnaire developed by (Barton et al.,2020). An independent t-test was used to evaluate differences in executive function skills between the two groups, with a significance level set at 0.05. The analysis indicated no significant overall differences in executive function scores between Taekwondo practitioners and non-practitioners. However, significant differences were observed specifically in planning and emotional regulation skills. The study suggests that further research with a larger sample size could enhance the validity and reliability of the findings.

Keywords: Executive Function Skills, Female, Taekwondo, Well-being.

1. Introduction

Taekwondo is a Korean martial art distinguished by its focus on high, fast kicks and dynamic techniques. It integrates elements from traditional Korean martial arts, Okinawan karate, and Chinese martial arts into a unique system. Practiced globally, Taekwondo is overseen by the International Taekwon-Do Federation (ITF) and the World Taekwondo Federation (WTF). It is known for its benefits in enhancing executive functions such as planning, organization, and emotional regulation. The structured training and emphasis on discipline in Taekwondo contribute to improvements in cognitive and behavioral skills, making it a valuable practice

for both physical and mental development.

Executive functions are cognitive abilities that include flexible thinking, memory, and self-control, essential for daily functioning and goal achievement. These skills help individuals manage their schedules and organize tasks effectively. Adolescence is a stage of significant change, involving hormonal shifts and physical development (Coleman & Hendry, 1990; Feldman & Elliott, 1990; Blakemore & Choudhury, 2006), which affects identity, self-awareness, and cognitive flexibility (Rutter & Rutter, 1993). During this period, individuals develop improved strategic thinking and multitasking abilities.

Complex cognitive processes include planning, developing strategies, exercising cognitive flexibility, and suppressing automatic reactions are all part of executive functions (Shallice & Burgess, 1991). Disruptions in these functions can occur due to abnormalities in the prefrontal cortex, often resulting from conditions such as tumors, infections, or brain injuries (Stuss & Benson, 1983; Tucha et al., 2000).

Plan Management: Plan management involves creating and implementing strategies for future goals, ensuring effective preparation and execution of tasks.

Time Management: Time management is the practice of organizing and prioritizing activities to prevent procrastination and make efficient use of time.

Emotional Regulation: Emotional regulation is the ability to control and adjust one's emotional responses. This includes managing reactions to challenging situations, concealing signs of distress, and focusing on positive aspects to maintain a balanced emotional state.

Organization: Organization is the skill of systematically arranging and managing tasks, information, and resources to ensure smooth and efficient task completion.

Behavior Regulation: Behavior regulation involves controlling impulses and avoiding unhealthy behaviors in response to emotions, helping to manage responses in a constructive manner.

Objective of the Study

To assess the impact of Taekwondo training on various executive functions in female students.

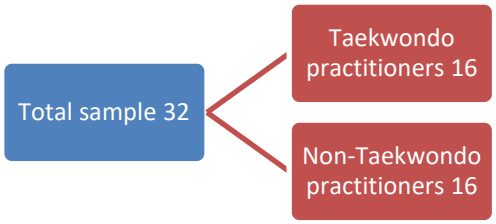
Hypotheses

There is a significant difference in executive functions among Taekwondo players due to Taekwondo training.

2. Research Methodology

Method

For this study, a Random Sampling technique was employed with a sample of thirty-two (N=32) female university students from Cotton University in Guwahati, India. The sample consisted of sixteen (16) Taekwondo practitioners and sixteen (16) non-practitioners, all aged between 15 and 24 years.



Tool

To assess the level of executive function skills, the study utilized a questionnaire developed by (Barton et al., 2020). This questionnaire comprises 25 items designed to measure skills across five domains, referred to as skill areas. Each item is rated on a scale from 0 (never) to 3 (very often). The five skill areas evaluated include planning management, time management, organization, emotional regulation, and behavioral regulation. The Executive Skills Questionnaire – Revised (ESQ-R) helps identify specific profiles of strengths and weaknesses in these areas to tailor interventions accordingly.

Procedure

The questionnaires administered the short 25-item online survey on the subjects from the university students which includes female taekwondo practitioners and non-taekwondo practitioners of university youth at Cotton University in Guwahati, India. Before the administration of the questionnaire, the researcher approached the subjects online on Microsoft Teams, over a phone conversation and asked them to increase their persistent cooperation within the data collection. The survey consists of 25 items that assess executive skills across five distinct domains, referred to as Skill Areas. Scores are reported as average values for each domain, ranging from 0 to 3, with lower scores indicating stronger abilities in that area. A score of 2 or higher suggests that the respondent frequently encounters difficulties in that skill area, as it indicates that the behaviors or challenges described are often or very often experienced.

Data Analysis

To analyze significant differences between the two experimental groups on the Executive Function Skills Questionnaire-Revised, mean values, standard deviations, and t-tests were calculated using the Statistical Package for the Social Sciences (SPSS).

4. Result and Interpretation pertaining to Executive Function

Table 1: Comparison of Means on Average Total Score of Taekwondo Training and Its Impact on the Variable Executive Functions

	No. of Subjects	Mean	S.D. (Standard Deviation	Mean Difference	Std. Error Difference	Calculated t-value
Taekwondo Female Practitioners	16	0.16	0.06	0.04	0.02	1.88
Non-Taekwondo Female Practitioners	16	0.21	0.08			

@Significant at 0.05level Tabulated t0.05(30) =2.042

Table-1 Presents t-value for comparing the adjusted means on average total score of executive Function skill in taekwondo practitioners and non-taekwondo practitioners female University Youth of Cotton University it was found that the calculated t-value is 1.88 (<2.042at 0.05) which are statically significant at 0.05 level of significance. It revealed that there is no significant difference in means on average total score of executive function skill between the taekwondo practitioners and non-taekwondo practitioners females.

Therefore, the research hypothesis "There is no significant difference in executive function skill between the taekwondo practitioners and non-taekwondo practitioners' females." accepted.

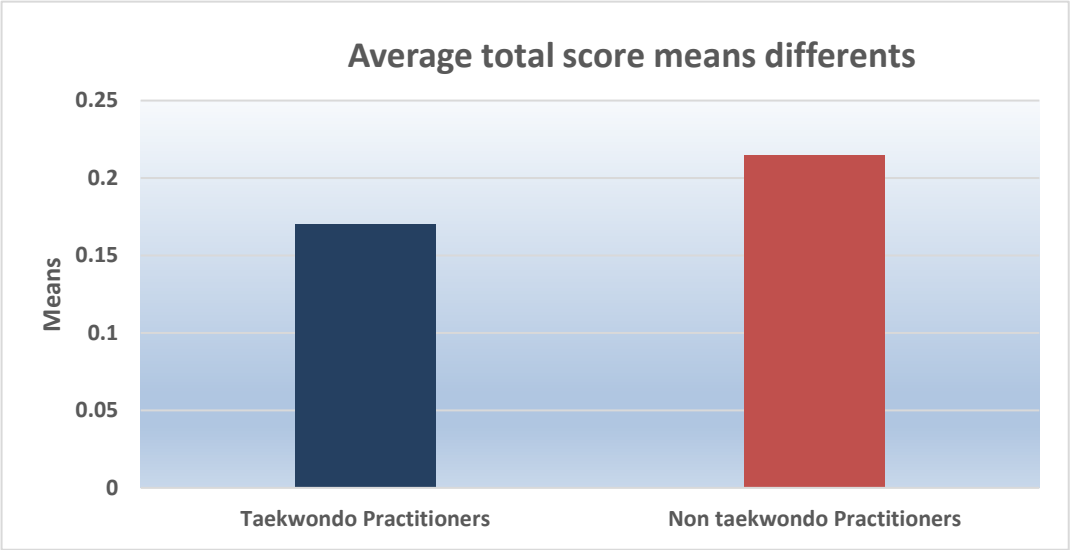
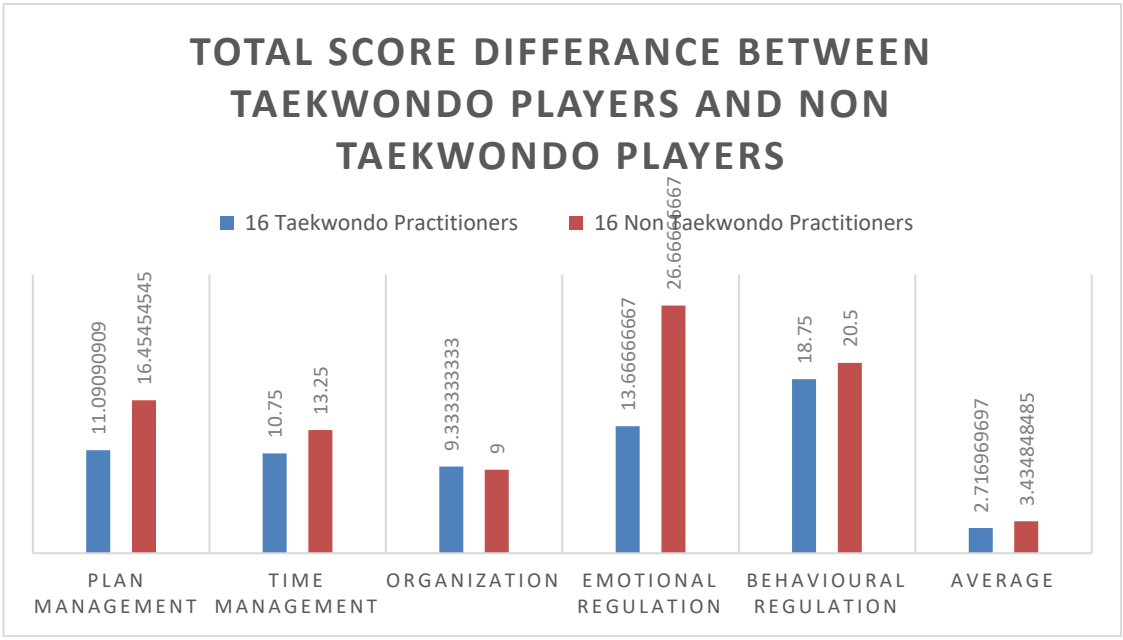


Fig-1. Graphical Presentation of Comparison of Means on Average Total Score of Taekwondo Training and Its Impact on The Variable Executive Functions

The ESQ-R results for individual students are summarized below, showing the total score and average scores for each skill area assessed by the survey. Lower scores indicate relative strengths, while higher scores suggest areas of weakness. If the average score is 2 or above, it means that students frequently rated items in that skill area as often or very often true, highlighting it as a potential focus for intervention. An appendix to this report includes a table detailing each student's responses to the 25 items on the ESQ-R.

Comparison between the different studied groups according to different executive functions Domain

Table-2. Fig-2 Difference between Taekwondo Practitioners and non-Taekwondo Practitioners Female University Youth of Cotton University on total score of 5 skills.



5. Discussion of the Results

Discussion Pertaining the Difference between Taekwondo Practitioners and non-Taekwondo Practitioners female University Youth Adolescents of Cotton University means on average

total score of executive Function skill –

The Analysis of Covariance results, as shown in Table 1, reveal significant differences between Taekwondo practitioners and non-practitioners regarding executive function skills among female university students at Cotton University. The computed t-value of 1.88, Since the value is lower than the critical threshold of 2.042 at the 0.05 significance level, it suggests that there is no statistically significant difference in the average executive function scores between Taekwondo practitioners and non-practitioners. The analysis indicates that there is no notable difference in the overall executive function skills between Taekwondo practitioners and non-practitioners. Interestingly, non-practitioners scored higher in executive function skills compared to Taekwondo practitioners. This disparity in scores may highlight areas where Taekwondo practitioners might need improvement, while also indicating their relative strengths. The low scores in Plan Management, Organization, and Time Management for both groups suggest these skills are generally strong among the students. Efficient organization and time management are likely contributing to their effective academic performance. Conversely, higher scores in Behavioral Regulation and Emotional Regulation indicate areas of weakness that may need attention. Overall, the results suggest that Taekwondo training has a positive impact on female adolescents, but there are specific executive function areas where further development could be beneficial.

Several earlier studies on executive function skills (Woods et al., 2002) have focused on using EF measures with adult ADHD populations. For instance, (Pennington and Ozonoff 1996) compared the performance of adults with ADHD, over 18 years old, to that of a control group without ADHD. (Cohen ,1988) defined the effect size as the difference between two means divided by the standard deviation of either group. It has been observed that executive functions, evaluated through both performance-based and survey measures, are linked to various aspects of daily life, including academic performance (Forbes et al., 2006)., social interactions (Dawson et al., 2012), and behavioral issues (Baird, Silver, & Veague, 2010; Giancola, Godlaski, & Roth, 2012). While some theorists argue that executive function is a unified construct that manifests differently depending on context (Duncan et al., 1996; Garon, Bryson, & Smith, 2008), this study adds to the existing literature by enhancing the treatment approaches for executive function.

Discussion of Hypothesis

At the start of the study, it was hypothesized that there would be no significant differences in executive function skills—such as Behavioral Regulation, Organization, Emotional Regulation, Time Management, and Plan Management—between female Taekwondo practitioners and non-practitioners at Cotton University. The analysis confirmed that there were indeed no significant differences in these skills between the two groups. As a result, the initial null hypothesis has been supported.

6. Conclusion

Considering the study's limitations and statistical analysis, it was concluded that there were no significant differences in executive function skills—such as Behavioral Regulation, Organization, Emotional Regulation, Time Management, or Plan Management—between

female Taekwondo practitioners and non-practitioners at Cotton University in Guwahati, India.

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