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Impact of Life Kinetic Training on Hand-Eye Coordination in Taekwondo Athletes

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Abstract

Objective: This study explored the impact of Life Kinetic training on hand-eye coordination in taekwondo players aged 11 to 14 years ($\bar{x}$=12.67± 1.01) who had achieved a red belt rank or higher. Materials and Methods: To investigate the effects of Life Kinetic training on hand-eye coordination, an experimental group of athletes (n=15) engaged in 45 minutes of these exercises twice a week for 8 weeks in addition to their regular taekwondo training. A control group (n=15) continued with only their taekwondo training. Hand-eye coordination was assessed using the Purdue Pegboard hand dexterity test before the intervention. Data analysis involved a two-factor mixed ANOVA with repeated measures. The Shapiro-Wilk test and skewness assessment were employed to verify the normality of the dependent variables. A p-value less than 0.05 indicated a statistically significant difference between the variables. Results: Based on the results of hand-eye coordination measurements, group-measurement interaction significantly impacted the outcomes ($p<0.05$) of right-hand placement, left-hand placement, pair-hand placement, and the combination test. Conclusion: Based on these results, it was found that the results of hand-eye coordination measurements of the experimental group, in which LK exercises were applied, showed more improvement than the control group performing traditional taekwondo training, and it was seen that Life Kinetic training improved hand-eye coordination. For this reason, it is considered useful to include Life Kinetic training in the routine of taekwondo athletes in addition to traditional taekwondo training.

Keywords: Life Kinetik, Purdue Pegboard, Taekwondo.

Life Kinetik Egzersizlerinin Taekwondo Sporcularında El-Göz Koordinasyonu Üzerine Etkileri

Özet

Bu çalışmanın amacı 11-14 ($\bar{x}$=12.67± 101) yaşları arasında bulunan, kırmızı kuşak ve üzeri taekwondocularda Life Kinetik egzersizlerinin el-göz koordinasyonu üzerine etkilerini araştırmaktır. Gereç ve Yöntem: Bu amaçla deney grubu sporcuları (n=15), taekwondo antrenmanlarına ek olarak 8 hafta boyunca haftada iki gün süre ile 45 dakikalık Life Kinetik egzersizleri uygulamışlardır. Kontrol grubu (n=15) ise taekwondo antrenmanlarına devam etmiştir. Deneysel işleme başlamadan önce el-göz koordinasyonu, Purdue Pegboard el beceri testi ile ölçülmüştür. Verilerin analizi, tekrarlı ölçümlerde iki faktörlü karma ANOVA analizi ile yapılmıştır. Bağımlı değişkenlerin normal dağılıp dağılmadığı, normallik testlerinden Shapiro-Wilk testi ve çarpıklığın standart değeri hesaplanarak incelenmiştir. P değerinin 0.05'ten küçük olduğu durumlarda değişkenler arasındaki fark anlamlı kabul edilmiştir. Bulgular: El-göz koordinasyonu ölçüm sonuçlarına göre ise sağ el yerleştirme, sol el yerleştirme, çift el yerleştirme ve birleştirme testi sonuçları üzerinde grup-ölçüm etkileşiminin etkisi ve ölçüm faktörünün etkisi anlamlıdır($p<0.05$). Sonuç: Bu sonuçlardan hareketle, LK egzersizlerinin uygulandığı deney grubunun, el-göz koordinasyonu ölçüm sonuçlarının, geleneksel taekwondo antrenmanı yapan kontrol grubuna göre daha fazla gelişim gösterdiği bulgusuna ulaşılmıştır ve Life Kinetik antrenmanlarının El-göz koordinasyonunu geliştirdiği görülmüştür. Bu sebeple Life Kinetic antrenmanının geleneksel taekwondo antrenmanına ek olarak taekwondo sporcularının rutinine dahil edilmesi yararlı görülmektedir.

Anahtar Kelimeler: Life Kinetik, Purdue Pegboard, Taekwondo

INTRODUCTION

Life Kinetic (LK) exercises are a training program with origins in Germany that has found worldwide recognition. The program is built to enhance neuronal learning, create new brain networks, reduce neural symptoms, and improve the concentration and performance of the visual system (15, 17, 22). This program aims to provide a multidimensional training regimen that combines coordinative, cognitive, and visual tasks. It integrates these elements in a manner that challenges participants cognitively while they engage in physical exercises (6). LK's effectiveness stems from its adaptability; exercises scale in difficulty along with individual ability, constantly challenging the brain to advance. The LK exercise model is remarkably versatile, applicable across age groups and even to athletic training. Elite athletes, from Olympic champions to world-renowned competitors, now regularly incorporate LK into their routines. This trend is mirrored by growing academic research on Life Kinetic – studies consistently demonstrate that just one weekly hour of LK training boosts concentration and significantly enhances physical and motor skills (15, 19, 22). Besides, recent research offers a breakthrough discovery: dedicating the same small amount of time to Life Kinetic exercises can noticeably delay the onset of dementia, simultaneously promoting physical and mental well-being through heightened concentration (9).

High-level athletic performance is achieved through a meticulously planned, implemented, and controlled training system grounded in scientific principles (16). Athletes attain excellence by training and honing their technical, tactical, physical, coordinative, cognitive, and other requisite skills (16). The speed and stability of skill acquisition are directly contingent on the level of various coordinative abilities. These skills must be effectively coordinated to optimize the utilization of technical and tactical skills (15, 16). Successful sports performance is predicated on the compatibility and integration of motor coordinative capacities (23,24). Regarding the underlying cognitive processes, it is believed that these are not merely mental acts, but are also intrinsically linked to the physical movements of the individual (18). This understanding suggests a bidirectional relationship, wherein cognitive processes mediate and modulate motor processes, and vice versa. Life Kinetic is a training method rooted in the findings of in-depth brain science research, drawing upon kinetic psychomotor and kinematic principles (10). This method adopts a training approach that simultaneously combines visual tasks, cognitive elements, and diverse movement patterns. Maintaining an element of enjoyment and playfulness during exercise, the visual system and coordination-based exercises contribute by stimulating and enhancing brain function. This approach also strengthens the structure of neural networks and promotes overall brain health by facilitating the creation of new neural connections, thereby enhancing cognitive and motor performance (10).

Education consists of concurrent exercises combining motor activities and cognitive elements with various movement patterns, along with training in visual perception, particularly peripheral visual field perception (6, 17). A key focus of the Life Kinetic exercise model is the visual perception system (16,23). It is estimated that visual perception constitutes a substantial portion of human sensory perception. Therefore, it is evident that training this fundamental sensory modality in an optimal manner is of paramount importance (16,17). This encompasses training continuous eye movements, target acquisition and fixation, peripheral vision, three-dimensional depth perception, and the estimation of distances and speeds (27). Visual-spatial perception is of great significance in the sport of taekwondo. During competition or training, the ability to perceive the movements of one's opponent and adopt appropriate attack or defense positions is a critical skill. The Life Kinetic approach recognizes the central role of visual perception in human sensory experience and seeks to enhance this modality through targeted training. By improving the dynamic interplay between the oculomotor system, the visual environment, and the cortical visual processing centers, the model aims to optimize visual-spatial awareness and perceptual-motor integration – capacities that are particularly salient in the context of dynamic sports like taekwondo.

The physiological definition of coordination refers to the harmonious functioning of muscles or muscle groups in executing movements. Hand-eye coordination, therefore, denotes the synchronized working of the hand and eye muscles during movement execution. Coordinating eye and arm movements is a central aspect of our natural behavior. Hand-eye coordination relies on a combination of retinal and extra-retinal signals necessary for accurate movement (4, 28, 29). Numerous sports disciplines demand excellent hand-eye coordination, which is directly related to visual reaction time and motor response speed (26). Hand-eye coordination is particularly crucial in individual sports that heavily utilize motor manipulative skills (e.g., taekwondo, boxing, karate), team sports such as handball, basketball, volleyball, and sports involving rackets. Motor coordination capacity encompasses the coupling of the nervous and musculoskeletal systems, producing a rapid, precise, and balanced motor reaction that can be assessed by measuring and comparing the reaction time of hand-eye or eye-foot coordination skills (3,14). Visual-motor coordination is essential for obtaining visual information from the environment about incoming objects (e.g., ball, kick, punch) during training, necessitating a high level of hand-eye coordination for athletes to react efficiently and quickly to external stimuli. Besides, they can develop adaptive movements required for specific situations on the field (25).

The competitive structure of taekwondo has traditionally been characterized as emphasizing physical attributes such as strength and endurance. However, with evolving competition rules, scoring systems, and advancements in training science, there has been an increased emphasis on the importance of factors like enhanced coordination skills and perceptual abilities, in addition to strength, within the competitive domain. This shift has provided a more holistic focus on developing the comprehensive capabilities of athletes. Taekwondo competitions necessitate the execution of intricate movement combinations, which demand high levels of perception, peripheral vision, and coordination. Given these requirements, it is imperative to investigate the effects of Life Kinetic exercises on taekwondo performance. As such, empirically evaluating the potential benefits of incorporating Life Kinetic exercises into taekwondo training regimens could yield valuable insights into optimizing athletes' preparedness for the multifaceted demands of competition. For these reasons, this study aimed to examine the effects of Life Kinetic exercises on hand-eye coordination among taekwondo practitioners aged 11-14 years with red belt and above.

METHOD

The present investigation employed a pretest-posttest control group design. The participants were red belt and above taekwondo athletes who have been in active training at Toros Sports Club and Mezitli Sports Hall for at least two years. All athletes and parents participating in the study were informed about the study and measurements. In addition, all participants and their parents read and signed the ethics committee approved 'Informed Voluntary Consent Form' and 'Informed Parental Consent Form'. From a predetermined pool of subjects, two groups were formed through random assignment. One group was randomly designated as the experimental group, while the other served as the control group. Before and after the intervention, baseline measurements of the dependent variable (hand-eye coordination) were taken using standardized assessment tools for all participants in both groups.

Research Group

The study sample comprised 30 healthy volunteer taekwondo athletes (15 girls, 15 boys) between 11 and 14 years of age ($\bar{x}$=12,67± 1,01). Participants were randomly assigned to either the Life Kinetic training group (n=15; 7 boys, 8 girls) or the control group (n=15; 8 boys, 7 girls) using a random sampling method. In experimental studies, attention was paid to randomisation assignment in order to reveal the effect of the procedure and to purify the group from possible confounding variables. In addition, measures such as balancing, equalisation and stabilisation were taken to ensure balance in the groups. The participants consisted of athletes who have been practising taekwondo for at least two years, red belt and above. Red belt and above athletes were determined as the sample of the study in order to ensure that the Taekwondo competencies of the participants were at the appropriate level and to adapt to the training programme applied. Age, training year, height and body weight information of the athletes are shown in Table 1 depending on group and gender variables.

Table 1. Descriptive data of the experimental and control groups

Groups	Gender	n	Age		Years of Training		Height (cm)		Weight (kg)	
			Mean	SD	Mean	SD	Mean	SD	Mean	SD
Experiment	Female	8	12.75	1.28	4.13	1.8	159.87	6.51	46.01	5.9
	Male	7	13.29	0.75	4.86	1.77	161.85	7.49	47.27	6.09
Control	Female	7	12.29	0.95	3.29	1.38	154.85	7.9	41.82	6.25
	Male	8	12.38	1.06	3.25	1.03	155.5	10.95	48	12.23

Data Collection

This study was designed in accordance with the Helsinki criteria and an informed consent form including the purpose, materials and methods of the study was used. Since the participants were younger than 18 years of age, a parental consent form was prepared and signed by the parents. Participants who voluntarily agreed to participate in the study were included in the study. Demographic and training history data were collected from each participant, including height, weight, age, belt rank, and years of taekwondo experience. Baseline assessments were completed and then all participants began an 8-week training period. The experimental group participated in the Life Kinetic training program for 45 minutes two days per week in addition to their regular taekwondo training 4 days per week. The Life Kinetic program was developed and implemented by the researcher who had received formal training in this methodology. Life kinetic training programme; Special LK exercises such as coordinated ball throwing, directional changes, parallel ball dance, jumping, cross movements with sample demonstration, target throwing, throwing the ball by indicating the hand to catch, forward line jumps, cloth in one hand, ball in the other hand, throwing the ball after rotation, controlled directional changes, playing with the ball on the badminton racket, rope drills, cross small ball throwing from the front and back of the body, throwing the ball by indicating the hand to hold. These exercises were applied to the athletes from simple to complex for eight weeks. Simultaneously, the control group continued their typical taekwondo training 4 days a week for a period of 8 weeks. Upon completion of the eight-week period, all participants underwent post-intervention assessments using the same measurement protocols as the baseline test.

Figure 1. Life Kinetic Exercises

Data Collection Tools

Purdue Pegboard Test

Hand-eye coordination was assessed using the Purdue Pegboard Test, a widely utilized instrument designed to evaluate dexterity against age-normed data. The Purdue Pegboard apparatus consists of a rectangular wooden board with two parallel rows of 25 holes spaced 1 cm apart, accompanied by four cups along the top to hold small cylindrical pins, washers, and collars. It was originally designed by Joseph Tiffin of Purdue University, West Lafayette, IN, in 1948 (13). The test comprises four distinct subtasks administered in a standardized sequence:

1. Participants inserted as many pins as possible into the row of holes on the right side using only their right hand within 30 seconds.
2. The same procedure was then performed with the left hand on the left row of holes.
3. Participants were instructed to bi-manually insert pins into the parallel rows simultaneously for 30 seconds.
4. In the assembly task, participants constructed "pin-washer-collar-washer" assemblies by alternating between hands for 60 seconds, with each complete assembly scoring 4 points.

For each subtask, the respective score (number of pins, assemblies) was recorded on the measurement form. This multifaceted assessment evaluates distinct components of hand-eye coordination, including unilateral and bilateral dexterity, as well as motor sequencing skills integral to many activities of daily living and sports.

Figure 2. Purdue Pegboard Test

Data Analysis

Two-factor mixed design ANOVA with repeated measures was used to evaluate the effects of Life Kinetic training on hand-eye coordination. The normality of the dependent variable was tested at each level of the independent variables using the Shapiro-Wilk test and standard skewness values (5), and the data were found to be normally distributed. Levene's test was conducted to assess the assumption of homogeneity of variances. In cases where this assumption was violated, Pillai's Trace test results were interpreted for mixed ANOVA models (11). An alpha level of 0.05 was used as the significance criterion for all statistical tests. In addition, effect size values showing how much of the variance in the dependent variable is explained by the independent variable are also given in the study. In $\eta 2$ value, 0.02 is considered as low effect size, 0.13 as average effect size and 0.26 and above as large effect size (5).

Ethical approval and institutional permission

Prior to commencing the study, ethics approval was obtained from the Mersin University Sports Sciences Ethics Committee (approval number: 08/08/2022-011).

FINDINGS

The hand-eye coordination assessment comprised four distinct subtests: right-hand placement, left-hand placement, bimanual placement, and assembly. Therefore, descriptive statistics of the findings are presented in separate tables as placement and combination tests.

Table 2. Descriptive statistics of the right, left and pair hand placement scores (number of pins) of the groups

Subtests/Tests			Right Hand Placement	Left Hand Placement	Pair Hand Placement
	Group	N	Mean±SD	Mean±SD	Mean±SD
Pre-test	Experiment	15	13.80±1.32	13.00±1.51	21.20±1.82
	Control	15	13.40±2.13	12.67±1.58	20.80±2.11
	Total	30	13.60±1.75	12.83±1.53	21.00±1.94
Post-test	Experiment	15	15.80±1.65	15.20±2.07	23.73±2.40
	Control	15	14.06±1.79	13.60±1.18	21.80±2.14
	Total	30	14.93±1.91	14.40±1.81	22.77±2.44

Descriptive statistics indicated comparable pretest mean scores between the experimental and control groups across all four subtests, suggesting no initial group differences. Following the 8-week intervention period where the experimental group underwent Life Kinetic exercise training, descriptive data revealed a marked increase in mean scores for the experimental group coupled with a relatively smaller increase for the control group. To evaluate the statistical significance of these observed differences in mean scores, a series of mixed analysis of variance (ANOVA) models were conducted separately for each of the four subtest measures, with time (pretest vs. posttest) as the within-subjects factor and group (experimental vs. control) as the between-subjects factor. The ANOVA results are summarized below:

Table 3. Mixed design ANOVA results for the difference in right, left and pair hand placement scores of the experimental and control groups

Subtests	Right Hand Placement			Left Hand Placement			Pair Hand Placement		
Factors	F	p	Eta square	F	p	Eta square	F	p	Eta square
Group (Experimental/control)	3.575	0.069	0.113	3.255	0.082	0.104	2.799	0.105	0.091
Measurement (pretest/posttest)	19.823	**0.000***	0.415	45.474	**0.000***	0.619	26.287	**0.000***	0.484
Group*Measurement	4.956	**0.034***	0.150	7.436	**0.011***	0.210	4.951	**0.034***	0.150
p<0.05									

According to the Table 3, for the right hand placement subtest, the mixed ANOVA revealed a significant interaction between time and group ($F(1,28) = 4.956$, $p<0.05$, $\eta2 = 0.15$). This indicates that Life Kinetic exercises had a differential effect on right hand placement over time based on group membership. When the eta squared value is examined, the moderate effect size ($\eta2 = 0.15$) suggests a meaningful impact. Furthermore, a significant main effect of time was observed ($F(1,28) = 19.823$, $p<0.05$, $\eta2 = 0.415$), demonstrating that right hand placement scores changed significantly across the study period. This finding supports the effectiveness of Life Kinetic exercises in improving right hand placement. Overall, both groups demonstrated improvements in right hand placement over time, the degree of improvement was significantly greater for the experimental group that received Life Kinetic exercise training compared to controls. This provides evidence that Life Kinetic exercises facilitated enhanced visuomotor dexterity specific to the right hand.

Analysis of left hand placement test, demonstrated a significant interaction between group assignment and time (pre- vs. post-intervention) on left hand placement scores ($F(1,28) = 7.436$, $p<0.05$, $\eta2 = 0.21$). This suggests that Life Kinetic exercises produced a differential effect on left hand placement over time, dependent on group membership. The effect size ($\eta2 = 0.21$) indicates a moderate impact of the intervention. Additionally, a significant main effect of time was found ($F(1,28) = 45.474$, $p<0.05$, $\eta2 = 0.619$), demonstrating a substantial change in left hand placement scores across the study period. These finding highlights that approximately 62% of the variance in performance can be attributed to the time factor (pre- vs. post-intervention).

The ANOVA results regarding the difference in the pair hand placement scores revealed that there was a significant interaction between group assignment (experimental vs. control) and time (pre-intervention vs. post-intervention) (F(1,28) =4.951, p<0.05, η2=0.15). Life Kinetic exercises showed a moderate level of effectiveness on the double hand placement test (η2=0.15). When the effect of the measurement factor was analyzed, the difference was significant (F(1,28) =26.287, p<0.05, η2=0.484). In addition, the measurement factor explained 48% of the performance change. It can be suggested that Life Kinetic exercises were effective in increasing the double hand placement test scores. The group variable alone was not an effective factor on the double hand placement test (F(1,28) =2.799, p>0.05).

Table 4. Descriptive statistics of the groups' combination test scores (number of pins)

Test	Group	N	Mean±SD
Pre-test	Experiment	15	30.07±2.89
	Control	15	28.13±3.22
	Total	30	29.10±3.16
Post-test	Experiment	15	34.00±3.09
	Control	15	29.20±3.93
	Total	30	31.60±4.24

The experimental group demonstrated a greater increase in the number of placements from pre-test to post-test (approximately 13%) compared to the control group (approximately 4%). ANOVA results (see table 4) were used to determine the statistical significance of this difference.

Table 5. Mixed design ANOVA results for the difference in the combination test scores of the experimental and control groups

Factors	F	p	Eta square
Group (Experiment/control)	8.783	**0.006***	0.239
Measurement (pretest/posttest)	37.000	**0.000***	0.569
Group*Measurement	12.163	**0.002***	0.303
p<0.05			

Analysis of the combination test scores revealed a significant interaction effect between group assignment (experimental vs. control) and time (pre- vs. post-intervention) (F(1.28) =12.163, p<0.05, η2=0.303). This indicates that Life Kinetic exercises produced a differential effect on combination test performance depending on group membership. Life Kinetic exercises showed a high level of effectiveness on the unification test (η2=0.303). The measurement factor also shows a significant difference within the groups (F(1,28) =37.00, p<0.05, η2=0.569). This finding suggests a substantial change in combination test scores across the study period, with approximately %57 of the variance in performance attributable to the time factor (pre- vs. post-intervention).

DISCUSSION AND CONCLUSION

The present study aimed to investigate the effects of Life Kinetic training on hand-eye coordination in youth taekwondo athletes, as assessed by the multidimensional Purdue Pegboard test. Analyses revealed significant interactive effects between group and time for right hand placement, left hand placement, bimanual placement, and the combination assembly task (all p<.05). These statistically significant interactions indicate that improvements in hand-eye coordination skills from pre- to post-test differed meaningfully between the Life Kinetic training group and control group across all test components. Specifically, while modest improvements were observed in the control group over the 8-week period, the experimental group that received supplemental Life Kinetic exercises demonstrated markedly greater gains in hand-eye coordination performance. The interaction effect sizes ranged from moderate to large, highlighting the substantial impact of the Life Kinetic intervention.

The study findings align with previous research demonstrating the efficacy of Life Kinetic (LK) training for enhancing hand-eye coordination abilities in youth populations. For instance, Büyüktaş (2) observed improvements in coordination skills among 10-14 years old tennis athletes after a 12-week LK training intervention. Similarly, Yaşar et al. (3) found partial positive effects of a 10-week LK program on hand-eye coordination in young archers. Orhan (20) also concluded that kinetic brain exercise protocols including LK activities benefited hand-eye coordination and academic achievement in 9-10 years old children. This study builds upon existing research investigating the benefits of LK exercises for motor skills development. In another study by Duda (7), the effects of applying the Life Kinetic method to football education on the effectiveness of football teaching were examined. The research group consisted of 48 football players aged 14-15 years and the study was conducted between 2010-2014. The results of the study showed that football training with the Life Kinetic method increased the motor efficiency of the players. This finding suggests that long-term Life Kinetic exercises can support physical development in athletes. In another study, athletes with an average age of 12.25 years and studying at a football school were included in the study to examine the effect of 8-week Life Kinetic training on coordinative abilities. The results showed that Life Kinetic training was effective on balance, rhythm and orientation, but not on differentiation ability (23). Özşengezer and Top (21) examined the impact of LK exercises on coordination skills in 18 middle school students (aged 10-14 years) with mild intellectual disabilities. Their findings demonstrated that regular LK training over a 10-week period yielded positive contributions to coordination development. These findings from the extant literature provide support for the potential effectiveness of LK exercises in our own study. Collectively, this body of evidence highlights the potential for LK training to facilitate visuomotor coordination development during critical periods of motor skill acquisition and neural plasticity in youth.

The hand-eye coordination process proceeds in a highly structured way. It involves initial visual localization of the target, focused attention to it, perceptual recognition of its spatial location, cognitive processing, schema development for reaching, and finally activation of limb muscles to perform the movement (8). Given this complex sequence, attention and concentration play a critical role in successful hand-eye coordination. Therefore, this section reviews existing research examining the effects of Life Kinetic exercises on attention and concentration. In a study by Komarudin (12), the effect of Life Kinetics exercises on the concentration of athletes in various team (basketball, soccer, volleyball) and individual (karate, archery, badminton) sports was investigated. After 11 weeks of training, a significant improvement was observed in the concentration levels of both team and individual athletes (12). These findings align with Awwaludin et al. (1), who examined the influence of diverse brain training models on concentration in basketball players. Their research suggests that such training programs can indeed impact concentration, with this effect potentially interacting with an individual's inherent intelligence. In a study conducted on taekwondo athletes similar to our study, Wijaya et al. (30) reported that Life Kinetic exercises improved the technical skills of athletes with low and high concentration levels in taekwondo athletes. Further supporting evidence comes from Yıldırım (32), whose study evaluated the effects of Life Kinetic training on volleyball players' attention and concentration. Their findings demonstrated a notable increase in these cognitive skills within the Life Kinetic training group. Similarly, Sugandi et al. (28) investigated the impact of learning models incorporating Life Kinetics on elementary school students' concentration levels. Their results emphasized the effectiveness of such models in enhancing student concentration. Grünke (9) explored the influence of Life Kinetic training on attention and fluid intelligence in children with severe learning disabilities. This study revealed a significant advantage in attention and cognitive processing speed for the group receiving Life Kinetic training compared to the control group. These findings highlight a potential link between children's coordination skills and cognitive performance speed (9). Therefore, a review of the literature reveals a convergence of results with our own study. These studies collectively suggest that Life Kinetic exercises offer positive benefits for concentration development in athletes, students, and individuals with learning disabilities.

In conclusion, although previous research has focussed on other sports, this study extends these findings to taekwondo. When evaluated together with other studies in the literature, it can be said that Life Kinetic exercises can be an important tool to improve the performance of athletes, students and disadvantaged individuals. The findings provide evidence that incorporating Life Kinetic (LK) training into taekwondo practice can provide significant benefits for athletes' hand-eye coordination. Improvements in multiple skill components suggest that LK training can potentially enhance overall taekwondo performance. Educators, coaches and therapists can improve participants' coordination, attention and concentration skills by integrating Life Kinetic exercises into their programmes. This can lead to noticeable improvements in both the physical and cognitive performance of individuals. Further research should investigate the potential mechanisms underlying these improvements and explore the long-term benefits of LK integration in various sport disciplines.

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