PENGARUH KEMAMPUAN *MOTORIK* DAN OPTIMALISASI GELOMBANG OTAK *BETA* TERHADAP FUNGSI *KOGNITIF*

TESIS

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PENGARUH KEMAMPUAN *MOTORIK* DAN OPTIMALISASI GELOMBANG OTAK *BETA* TERHADAP FUNGSI *KOGNITIF*

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Sebuah Tesis yang diajukan untuk memenuhi salah satu syarat memperoleh gelar Magister Pendidikan Olahraga (M.Pd.) pada Sekolah Pascasarjana Universitas Pendidikan Indonesia Program Studi Pendidikan Olahraga

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Tesis ini tidak akan terselesaikan tanpa bantuan, dukungan, dan bimbingan dari berbagai pihak. Oleh karena itu, penulis menyampaikan rasa terima kasih yang tulus kepada semua pihak yang telah memberikan dukungan, baik secara langsung maupun tidak langsung. Ucapan terima kasih penulis sampaikan kepada dosen pembimbing yang dengan sabar memberikan arahan dan masukan, kepada pihak sekolah yang telah memberikan izin serta dukungan dalam pelaksanaan penelitian, dan kepada keluarga tercinta yang selalu memberikan semangat dan doa dalam setiap langkah penulis. Penulis menyadari bahwa tesis ini masih jauh dari sempurna. Oleh karena itu, segala bentuk kritik dan saran yang membangun sangat penulis harapkan demi perbaikan karya ini ke depannya. Semoga tesis ini dapat bermanfaat bagi pembaca dan menjadi bahan referensi untuk pengembangan keilmuan yang lebih lanjut.

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PENGARUH KEMAMPUAN *MOTORIK* DAN OPTIMALISASI GELOMBANG OTAK *BETA* TERHADAP FUNGSI *KOGNITIF*

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ABSTRAK

Penelitian ini menganalisis pengaruh kemampuan motorik dan optimalisasi gelombang otak beta terhadap fungsi kognitif pada siswa sekolah dasar. Konsep movement-based learning dan neuroplastisitas menjadi dasar teori, yang menyatakan bahwa latihan fisik terstruktur dapat meningkatkan fungsi kognitif melalui mekanisme neurofisiologis. Penelitian ini menggunakan desain eksperimen dengan kelompok kontrol dan eksperimen. Sampel terdiri dari 30 siswa berusia 10–11 tahun, dibagi secara merata ke dua kelompok. Kelompok eksperimen mengikuti program latihan motorik terstruktur yang menitikberatkan pada koordinasi, kelincahan, dan kecepatan reaksi, sedangkan kelompok kontrol mengikuti aktivitas rutin sekolah. Kemampuan motorik diukur dengan tes keterampilan motorik karangan Gallahue, gelombang otak beta diukur dengan EEG, dan fungsi kognitif dinilai melalui instrument Mini mental scale For Children. Analisis menggunakan Structural Equation Modeling berbasis Partial Least Squares (SEM-PLS). Hasil menunjukkan kemampuan motorik berpengaruh signifikan terhadap fungsi kognitif ($\beta = 0.93$, $p < 0.001$) dan gelombang otak beta juga berpengaruh signifikan ($\beta = 0.78$, $p < 0.001$), serta memediasi hubungan keduanya ($\beta = 0.693$, $p < 0.001$). Temuan ini mendukung integrasi latihan motorik kompleks dalam kurikulum pendidikan jasmani untuk mendukung perkembangan kognitif anak. Secara praktis, hasil ini menunjukkan bahwa peningkatan fungsi kognitif anak dapat dicapai melalui strategi pembelajaran jasmani yang berbasis aktivitas motorik terstruktur. Dengan kata lain, aktivitas fisik tidak hanya berdampak pada kebugaran, tetapi juga dapat dijadikan sarana intervensi sederhana, murah, dan mudah diterapkan di sekolah untuk meningkatkan kemampuan berpikir, konsentrasi, serta kesiapan belajar anak. Temuan ini penting bagi guru, praktisi pendidikan, dan pembuat kebijakan dalam merancang program pendidikan jasmani yang berorientasi pada pengembangan kognitif sekaligus motorik.

Kata kunci: kemampuan motorik, gelombang otak beta, fungsi kognitif, SEM-PLS

THE EFFECT OF MOTOR ABILITY AND BETA BRAIN WAVE OPTIMIZATION ON COGNITIVE FUNCTION

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Abstract

This study analyzes the effect of motor skills and beta brainwave optimization on cognitive function in elementary school students. The concepts of movement-based learning and neuroplasticity form the theoretical basis, which states that structured physical exercise can improve cognitive function through neurophysiological mechanisms. This study used an experimental design with a control group and an experimental group. The sample consisted of 30 students aged 10–11 years, divided evenly into two groups. The experimental group participated in a structured motor training program that emphasized coordination, agility, and reaction speed, while the control group participated in routine school activities. Motor skills were measured using the Gallahue motor skills test, beta brainwaves were measured using EEG, and cognitive function was assessed using the Mini mental scale For Children instrument. The analysis used Structural Equation Modeling based on Partial Least Squares (SEM-PLS). The results showed that motor skills significantly influenced cognitive function ($\beta = 0.93$, $p < 0.001$), and beta brain waves also significantly influenced ($\beta = 0.78$, $p < 0.001$), and mediated the relationship between the two ($\beta = 0.693$, $p < 0.001$). These findings support the integration of complex motor skills training into the physical education curriculum to support children's cognitive development. Practically, these results demonstrate that improving children's cognitive function can be achieved through physical education strategies based on structured motor activities. In other words, physical activity not only impacts fitness but can also be used as a simple, inexpensive, and easily implemented intervention in schools to improve children's thinking skills, concentration, and readiness to learn. These findings are important for teachers, education practitioners, and policymakers in designing physical education programs that focus on both cognitive and motor development.

Keywords*: motor skills, beta brain waves, cognitive function, SEM-PLS*

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