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Research Bulletin

March 2026 Publications

PHYSICAL DEVELOPMENT WAS MONITORED IN CHILDREN WITH MILD INTELLECTUAL DISABILITIES

A comprehensive three-year study was conducted to determine the physical fitness levels of children with mild intellectual disabilities. During this period, key health indicators such as body composition, flexibility, and muscular strength were regularly monitored. Based on the data obtained, significant differences were observed between boys and girls in terms of development rates and physical capacities.

Table 1 Changes in the body composition of the groups over the three-years.

Variables	Groups	Baseline	II	III	Interaction effect (group × time)		
		Mean ± SD (95% CI)	Mean ± SD (95% CI)	Mean ± SD (95% CI)	F	*P* value	η^2 p
Body mass (kg)	Female	43.62 ± 9.14 (40.8–46.4)	47.65 ± 9.65 (44.6–50.6)	51.30 ± 10.05 (48.1–54.4)	16.818	0.001*	0.134
	Male	44.29 ± 9.80 (41.9–46.6)	49.27 ± 10.87 (46.7–51.8)	53.05 ± 11.31 (51.6–56.9)			
Height (cm)	Female	150.78 ± 7.28 (148.3–153.2)	154.63 ± 6.62 (152.1–157.1)	157.59 ± 5.77 (155–160.1)	31.701	0.001*	0.225
	Male	149.89 ± 8.99 (147.8–151.9)	155.14 ± 9.63 (153–157.2)	160.15 ± 8.87 (157.6–162.3)			
BMI (kg/m^2)	Female	18.97 ± 2.55 (18.2–19.7)	19.74 ± 2.74 (18.9–20.5)	20.5 ± 3.04 (19.7–21.2)	0.052	0.917	0.000
	Male	19.47 ± 2.52 (18.8–20.09)	20.22 ± 2.65 (15.9–20.8)	20.76 ± 2.71 (20.2–21.6)			

Notes.
*$p < 0.05$.

Ergin, M., Koçak, Ç. V., Bozdağ, B., Sönmez, H. G., Karahan, M., Canli, U., Bartik, P., Sagat, P., Perez, J., & Prieto-González, P. (2026). Follow-Up of Health-Related Physical Fitness Elements in Mild Intellectual Disability for Three Years: A Sex Comparison. *PeerJ*, e20919, 1–10. https://doi.org/10.7717/peerj.20919

A NEW ERA IN THE ANALYSIS OF BRAIN MODELS WITH ARTIFICIAL INTELLIGENCE

An artificial intelligence–based system called "BrAIn" has been developed to accelerate the analysis of "brain organoids," which are described as miniature replicas of the human brain created in laboratory environments. With this system, the analysis of complex images—normally a time-consuming process—can be performed much faster and with greater accuracy. This technology provides significant support to scientists in research aimed at understanding the causes of diseases and discovering new treatment methods.

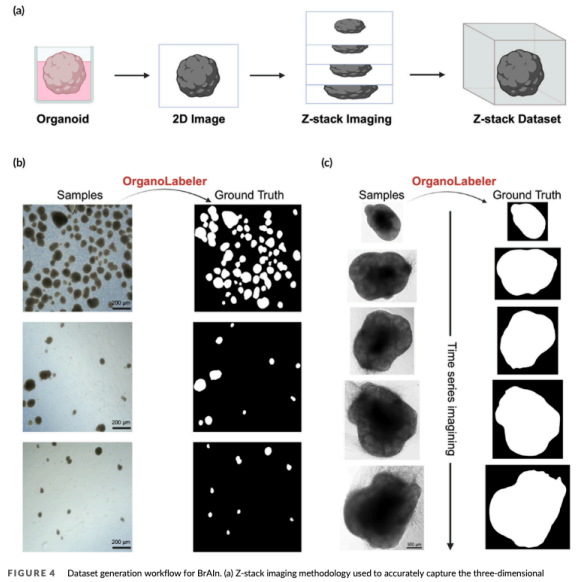


FIGURE 4 Dataset generation workflow for BrAIn. (a) Z-stack imaging methodology used to accurately capture the three-dimensional complexity of BOs. (b) Automated annotation of the EB dataset using the OrganoLabeler tool. (c) Time-series image acquisition for the developmental analysis of BOs, with dataset annotation performed using OrganoLabeler.

Kahveci, B., Polatli, E., Evranos, A. E., Güner, H., Karakülah, G., Bastanlar, Y., & Güven, S. (2026). BrAIn: A Comprehensive Artificial Intelligence-Based Morphology Analysis System for Brain Organoids and Neuroscience. *Bioengineering and Translational Medicine*. https://doi.org/10.1002/btm2.70123

A NEW ERA IN AI-DRIVEN AND RECYCLING-ORIENTED ENTREPRENEURSHIP

A new model focused on AI-supported circular transformation and social entrepreneurship has been examined to enhance the success of sustainable entrepreneurship. Within the scope of the study, the role of digital capabilities and knowledge integration in this process was analyzed using data collected from managers working in technology companies. It was determined that a system in which waste is reduced and resources are managed more efficiently—enabled by the use of artificial intelligence technologies—directly influences entrepreneurial success.

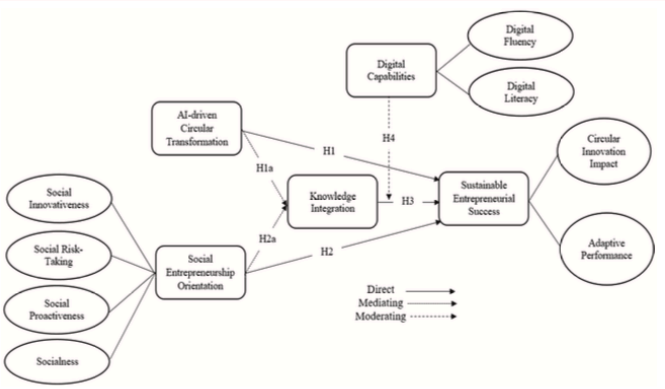


Fig. 1. Conceptual model.

Murad, M., Wang, M., & Shah, S. H. A. (2026). The Synergistic Engine of Sustainable Entrepreneurship: Fueling AI-Driven Circular Transformation and Social Entrepreneurial Orientation With Knowledge Integration and Digital Capabilities. *Journal of Innovation and Knowledge, 16*, Article 101008. https://doi.org/10.1016/j.jik.2026.101008

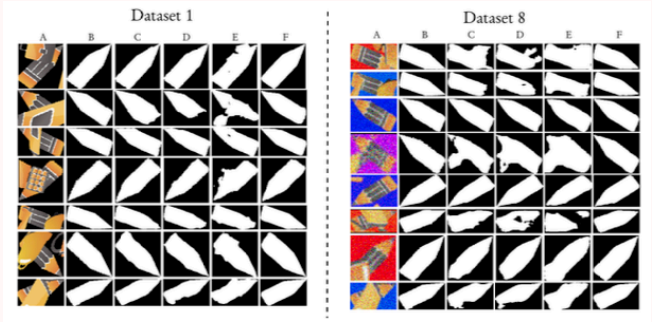


Figure 8. Qualitative comparison of model predictions on Dataset 1 and Dataset 8. The (**left panel**) corresponds to Dataset 1, and the (**right panel**) corresponds to Dataset 8. (**A**) Input image, (**B**) ground-truth mask, (**C**) prediction by *Attention U-Net*, (**D**) prediction by *U-Net*, (**E**) prediction by *FourierNet*, and (**F**) prediction by *FUNet*.

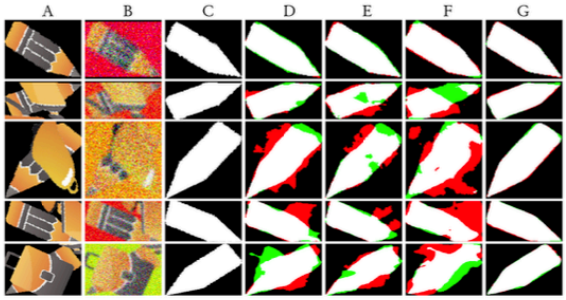


Figure 9. Qualitative comparison of segmentation performance under noise/corruption. (**A**) Input image from Dataset 1. (**B**) Input image from Dataset 8. (**C**) Ground-truth mask. (**D**) Prediction by *Attention U-Net*. (**E**) Prediction by *U-Net*. (**F**) Prediction by *FourierNet*. (**G**) Prediction by *FUNet*.

AN ARTIFICIAL INTELLIGENCE TECHNOLOGY THAT BETTER RECOGNIZES OBJECTS HAS BEEN DEVELOPED

A new method has been developed to reduce the loss of accuracy that occurs when objects in images are occluded. In the study, it was demonstrated that object boundaries can be represented with less data by utilizing the frequency information of images. With this approach, more reliable results were obtained even under challenging conditions such as noise, blur, and occlusion. Tests revealed that the proposed model achieves higher accuracy compared to existing methods. It was stated that these findings could contribute to the advancement of image analysis across various fields.

Güzel, Y., Aydın, Z., & Talu, M. F. (2026). Frequency-Based Deep Occlusion Awareness Instance Segmentation. *Mathematics, 14*(5), Article 792. https://doi.org/10.3390/math14050792

A NEW MODEL FOR SMART AND ECO-FRIENDLY ENERGY COMMUNITIES HAS BEEN DEVELOPED

A new strategic model for "Hybrid Smart Micro Energy Communities" has been developed to enable more efficient and environmentally friendly energy management in future cities. Within the scope of this study, the local implementation of systems that integrate multiple renewable energy sources—such as solar and hydropower—was analyzed. Through the developed decision-support mechanism, it is aimed to reduce energy costs and lower carbon emissions.

Figure 2. Smart Energy Community: (**a**) Top view showing few households, restaurant and church; (**b**) view of the available water stream surrounding this community; (**c**) bridge over the water stream; (**d**) household with old water mills to replace one by a water-wheel turbine; (**e**) overlaying of the existent old intake channel, which is out of service, to connect to the water-wheel identical to the old water mill.

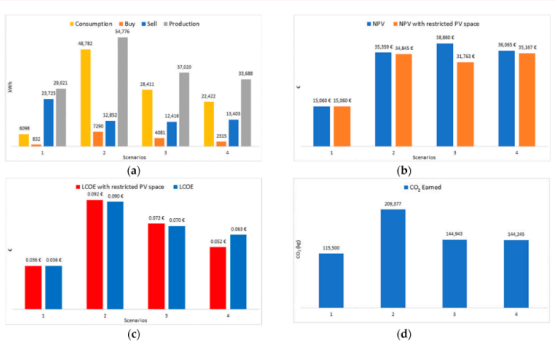
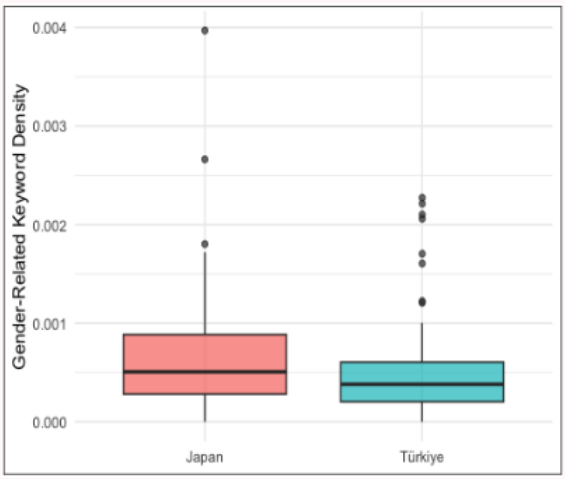


Figure 9. Annual energy balance by scenario in kWh (**a**); comparison of NPV across scenarios without and with PV surface limitation (**b**); comparison of LCOE with/without restricted PV space (**c**); and CO_2 earned across scenarios (**d**).

Ramos, H. M., Erdfarb, A., Demircan, I., Koca, K., McNabola, A., Coronado-Hernández, O. E., & Pérez-Sánchez, M. (2026). Strategic Modeling of Hybrid Smart Micro Energy Communities: A Decision-Oriented Approach. *Urban Science, 10*(2), Article 107. https://doi.org/10.3390/urbansci10020107

GENDER EQUALITY STRATEGIES OF UNIVERSITIES IN JAPAN AND TÜRKİYE WERE EXAMINED

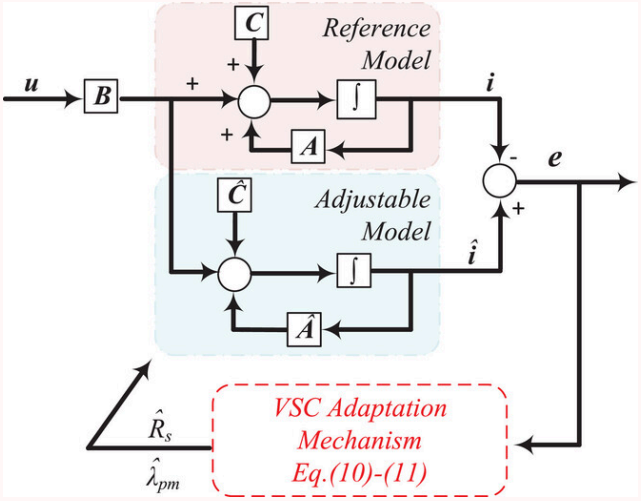


The strategic plans of 209 universities in Japan and Türkiye were analyzed using natural language processing methods in a computational environment, within the context of gender equality and inclusivity goals. The analysis revealed that Japan tends to use more future-oriented and abstract expressions, whereas Türkiye employs more bureaucratic and past-oriented language. In both countries, it was found that marginalized groups such as migrants and women academics are not sufficiently represented in the strategies. Although inclusive values are frequently emphasized, it was highlighted that concrete and structural action steps are largely absent from the plans.

Bengü, E., Çoymak, A., Rogler, A., & Morozumi, A. (2026). Gender Equity, Internationalization, and the Quintuple Helix: Comparative NLP Analysis of University Strategies in Japan and Türkiye. *Journal of International Students, 16*(8), 153-180. https://doi.org/10.32674/je5apa51

A NEW MECHANISM HAS BEEN DEVELOPED FOR THE ONLINE CONTROL OF INTERIOR PERMANENT MAGNET MOTORS

A new adaptation mechanism has been developed to simultaneously estimate the parameters of interior permanent magnet synchronous motors during operation. In this context, motor performance was thoroughly analyzed in a computational environment by combining model reference adaptive systems with variable structure control techniques. This newly developed control method is intended to significantly improve the overall stability and energy efficiency of electric motors widely used in industrial systems. Comprehensive tests demonstrated that the proposed mechanism operates with high accuracy and reliability under variations in speed and system parameters.



Ates, E., Tekgun, B., & Barut, M. (2026). An adaptation mechanism of model reference adaptive system based on variable structure control for online parameter estimation of IPMSM. *IET Control Theory and Applications, 20*(1), e70080. https://doi.org/10.1049/cth2.70080

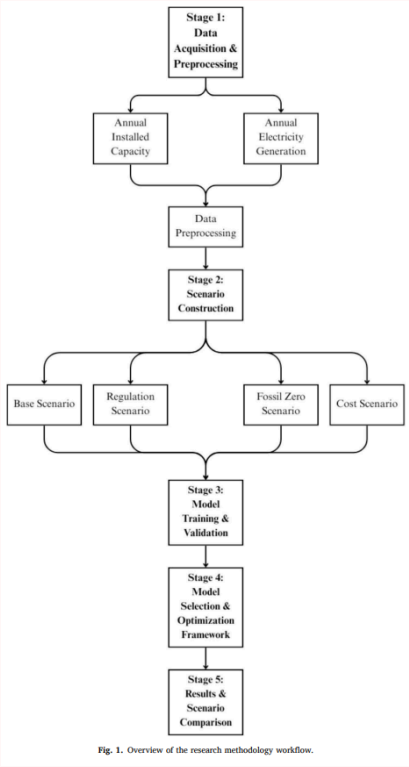


Fig. 1. Overview of the research methodology workflow.

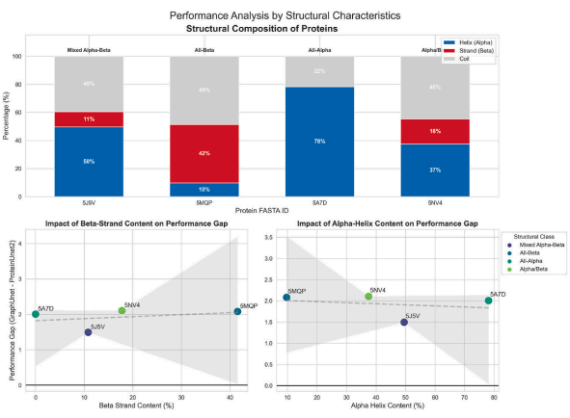
TÜRKİYE'S RENEWABLE ENERGY TRANSITION UNDER THE 2053 NET ZERO TARGET HAS BEEN MODELED

Türkiye's renewable energy transition required to achieve the 2053 net zero emission target was modeled using artificial intelligence and scenario-based software. The capacities of solar, wind, hydroelectric, geothermal, and biomass energy were analyzed. It was determined that current policies are insufficient to reach the net zero target. To achieve this goal, it was emphasized that investments in solar and wind energy must be significantly increased, energy storage systems should be integrated, and the grid infrastructure needs to be strengthened. The study provides a strategic roadmap for future energy planning.

Sutcu, M., Sahin, N., Gulbahar, I. T., Yildiz, B., & Almomany, A. (2026). Machine learning and scenario-based forecasting of Türkiye's renewable energy transition toward net-zero 2053. *Energy Conversion and Management: X, 30,* 101719. https://doi.org/10.1016/j.ecmx.2026.101719

A NEW DEEP LEARNING MODEL HAS BEEN DEVELOPED FOR PREDICTING PROTEIN SECONDARY STRUCTURES

A new deep learning model based on the U-Net architecture, named GraphUnet-SS, has been successfully developed for secondary structure prediction—an essential step in understanding the three-dimensional structures and functions of proteins. In this model, graph-based data were constructed using contact predictions to map interactions between amino acids. The system, which integrates various artificial neural network layers, was found to achieve higher accuracy compared to existing methods. This approach is expected to make a significant contribution to structural prediction processes in the field of bioinformatics.



Görmez, Y., Sabzekar, M., & Aydin, Z. (2026). GraphUnet-SS: A novel deep learning model for protein secondary structure prediction based on U-Net architecture. *Computers in Biology and Medicine, 205*, 111598. https://doi.org/10.1016/j.compbiomed.2026.111598

DEVELOPMENT OF BRAIN ORGANOID MODEL TO TEST MULTI-TARGETED PHARMACEUTICAL AGENTS FOR MULTIPLE SCLEROSIS AND COGNITIVE IMPAIRMENT AND STUDY ALTERNATIVE EXTRACELLULAR MATRIX FOR BRAIN ORGANOID GENERATION

Researchers have created brain organoids to model multiple sclerosis (MS), using GelMA and Matrigel with LPS treatment to mimic disease pathology. This method allows for the evaluation of new therapies, such as the promising drug candidate ST-1505, which significantly improves myelination and reduces inflammation in organoids, offering new insights into MS treatment.

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INVESTIGATION OF SH2 DOMAINS OF SPLEEN TYROSINE KINASE ENZYME FOR TARGETING ACUTE MYELOID LEUKEMIA USING BOTH IN SILICO AND IN VITRO STUDIES

Research identifies Spleen Tyrosine Kinase (Syk) inhibitors as promising for Acute Myeloid Leukemia (AML) treatment, targeting SH2 domains and kinase domain. These inhibitors reduce cancer cell viability and induce apoptosis, offering a novel approach to combat AML's genetic complexities.

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