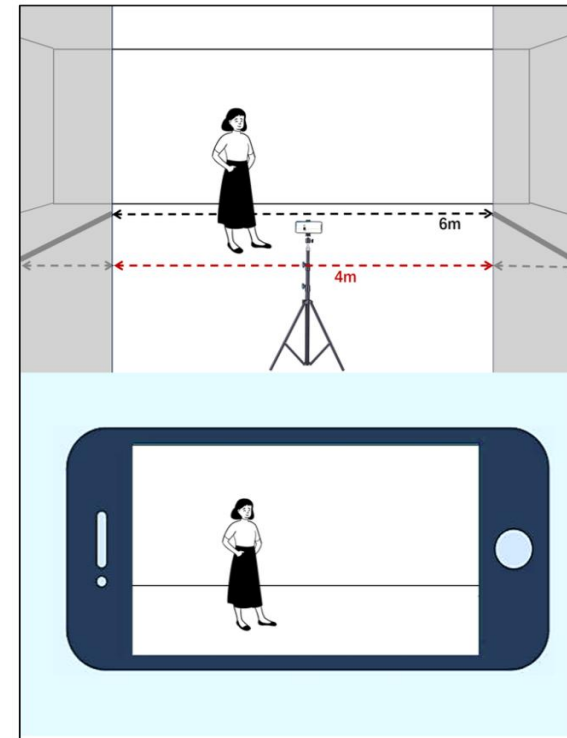
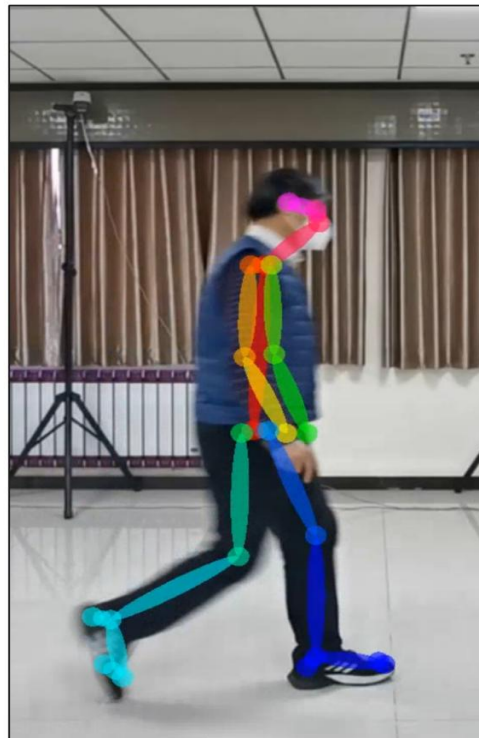


Smartphone-Based Spatiotemporal Gait as a Digital Phenotype for Motor-Cognitive Dual Decline: Screening Feasibility and Accuracy in a Community-Dwelling Cohort

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Spatiotemporal Gait as a Digital Phenotype for Motor-Cognitive Dual Decline: Screening Feasibility and Accuracy in a Community Cohort

INTRODUCTION	METHODS	RESULTS	CONCLUSIONS	REFERENCES								
Motor and cognitive functions are interdependent core resources of healthy aging. Motor-cognitive dual decline (MCDD) represents a high-risk state for dementia and loss of independence. However, scalable screening tools remain scarce. Spatiotemporal gait, integrating neuromuscular control, may serve as a sensitive digital phenotype. This study validates smartphone-based spatiotemporal gait analysis as a digital phenotype for identifying MCDD in community settings.	This study involved 318 community-dwelling Chinese older. Linear regression assessed associations between gait metrics and motor/cognitive functions. XGBoost classifiers were developed to compare the discriminative power of the gait digital phenotype against established assessment tools, including motoric cognitive risk syndrome (MCR), physio-cognitive decline syndrome (PCDS), and cognitive frailty (CF).	The participants had a mean age of 73.36 years, and 64.7% were women. Spatiotemporal gait features exhibited discrete associations with motor and cognitive domains: stride length and single support time primarily reflected motor function, while stride time and double-support time were indicative of cognitive integrity (p <0.05). The gait-based classifier achieved an AUC of 0.859, significantly outperforming MCR (AUC=0.658) and demonstrating comparable utility to more resource-intensive tools (PCDS: 0.968; CF: 0.962). Optimal thresholds for community screening included gait speed <0.82 m/s, stride length <0.95 m, and stride time >1.1 s.	Smartphone-derived spatiotemporal gait is a valid digital phenotype for MCDD. It effectively balances accuracy with scalability, potentially enabling the widespread, low-cost screening necessary for early intervention in community healthcare. a Video recording  b Pose estimation  c Feature extraction <table><tr><td colspan="2">Task condition: Single-task, Dual-task</td></tr><tr><td colspan="2">Spatio-temporal features Gait speed</td></tr><tr><td>Spatial features Stride length</td><td>Temporal features Cadence Stride time Double support phase Single support phase</td></tr><tr><td colspan="2">Spatiotemporal series features Permutation entropy Autocorrelation coefficient</td></tr></table>	Task condition: Single-task, Dual-task		Spatio-temporal features Gait speed		Spatial features Stride length	Temporal features Cadence Stride time Double support phase Single support phase	Spatiotemporal series features Permutation entropy Autocorrelation coefficient		[1] Čepukaitytė, G., Newton, C., & Chan, D. (2024). Early detection of diseases causing dementia using digital navigation and gait measures: A systematic review of evidence. <i>Alzheimers Dement</i>, 20(4), 3054-3073. doi:10.1002/alz.13716 [2] Íaz-Arancibia, J., Córdova, M., Arango-López, J., Ahumada, D., & Moreira, F. (2023). Automatic gait analysis through computer vision: a pilot study. <i>Neural Computing and Applications</i>. doi:10.1007/s00521-023-08549-2 
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