令和８年度　大学院博士後期課程

一般Ⅱ期・社会人Ⅱ期

バイオテクノロジー専攻　試験問題（外国語）

問題　次の英文を日本語で全訳しなさい。

1. Introduction

Recent advancements in sensing technology offer the potential for objective, low-cost, and easily implementable assessments of activities of daily living (ADLs), physical function, and fall risk (Sun et al., 2018). Other studies have also attempted to utilize sensing technologies, such as KINECTTM, to evaluate motor function and engage older adults in interactive games (Adams et al., 2015; Fidan et al., 2024; Koh et al., 2022). However, only two studies have employed cameras equipped with infrared depth sensors, such as KinectTM, to assess ADLs (Takeshima et al., 2019, 2020), which demonstrated that the 20-s stepping test (ST) and/or the chair stand test (CST), when assessed using Kinect™, exhibited strong discriminatory performance in detecting individuals requiring assistance. In particular, greater head total movement distance (TMD) and movement displacement from the starting position (MMD) during the ST appear to be indicators of disability, with moderate sensitivity and specificity in older adults. Additionally, studies have found significant differences in knee movement distance (KMD) during the ST between older women who have and have not experienced falls (Takeshima et al., 2024b).

Evidence has also shown that the trunk forward tilt angle (TFTA) during the CST was significantly greater in frail older adults than in their healthy counterparts. The optimal threshold for identifying frailty using the TFTA was determined through receiver operating characteristic curve analysis, with a TFTA of 23.1° providing the highest combination of sensitivity (79%) and specificity (73%) (Takeshima et al., 2019). However, given that these results were derived from a small sample, the validity of the discrimination threshold remains uncertain. This study attempted to establish age-related normative data based on a large sample of independent-living older women.

(略)

5. Conclusion

This study successfully established normative reference values and a practical 5-point assessment criteria using percentile values of 5%, 25%, 50%, 75%, and 95% for evaluating functional movement in older women using KinectTM-based infrared motion analysis. Grade 3 (25~75%) across all ST and CST parameters was assumed to represent reference range. In particular, movement metrics of the head and knees during the 20-s ST (such as TMD, MMD, and KMD) and the TFTA during the CST can be used to practically and objectively evaluate ADLs and identify individuals at risk of functional decline. Given its simplicity and ease of use, the 5-point criteria offer the potential to serve as a practical diagnostic tool for evaluating ADLs in older adults. Our findings support the feasibility and clinical potential of using optical sensor technology for early identification of individuals at risk of losing independence. While the study had limitations related to measurement constraints and data loss, the large sample size and focus on community welling older adults enhance the generalizability of our results. Future research should aim to refine these methods, explore longitudinal outcomes, and validate the proposed criteria across diverse populations to promote widespread implementation in community health and preventative care settings.

In addition, standard values normalized by height were shown for TMD, KMD, MMD, and MKH. As the current dataset includes only women, future work will expand to include men and a wider range of age groups, with an aim of analyzing additional factors influence evaluation outcomes and establishing a more comprehensive and effective evaluation index.

【出典】Nobuo Takeshima, Eiji Fujita, Takeshi Kohama, Yosuke Osuka, Narumi Kojima, Masanobu Kusunoki, Yukiya Oba, Hiroyuki Sasai. (2025). The 20-s Stepping Test and Chair Stand Test Using an Infrared Depth Sensor: Criteria for the Evaluation of Activities of Daily Living Among Older Women. International Journal of Sport and Health Science, 23, 55-66.

出題意図および評価のポイント

出題意図：本試験は、スポーツ科学分野の学術英文を題材に、体幹機能や安定性の考え方、既存の評価テストの課題、新しい計測技術（センサー）を用いる意義、発達・適応に関する背景を含む研究の流れを正しく理解し、その論旨を専門用語を踏まえて自然な日本語に訳す力を評価することを目的とする。

評価のポイント：①用語の精確さ、②因果・対比・限定関係を保った忠実さ（脱落・誤訳なし）、③読みやすい日本語（直訳調を避け句読点・文分け適切）等の観点から評価。