

A Multi-phase Methodological Framework For Non-invasive

Dementia Pre-diagnosis

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Introduction

Early detection of dementia at the primary care level remains a persistent challenge, particularly in Latin America, where a substantial proportion of cases remain undiagnosed [1]. Diagnosis frequently occurs at advanced stages, when clinical symptoms are clearly manifested and patients are referred to specialist services [2]. In this context, the development of early diagnostic technologies represents a valuable resource for primary care clinicians, enhancing the detection of subtle and early indicators of dementia.

Methods

Phase 1: Affective-Cognitive Couplin. (Emotion During MMSE Procedure)

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 Facial expressions were captured via webcam and analyzed using facial emotion recognition software.
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 Data Collected: Valence levels aligned with specific MMSE sub-items.

Phase 2: Linguistic Markers (Speech Analysis)

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 Procedure: Participants performed structured tasks including picture description and paragraph reading.
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 Features Extracted: Lexical richness, speech rate and pause frequency.
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 Analysis: Between-group comparisons.

Phase 2: Motor Markers (Gait Analysis)

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 Procedure: A wearable prototype was iteratively developed, focusing on structural design, sensor integration, and system functionality.
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 System Design: Hardware and software components were co-developed to support gait data acquisition and visualization.
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 Output: Real-time display of basic gait parameters through a user-friendly interface.

Results

Phase 1

The system enabled dynamic tracking of frustration, confusion, or engagement during specific MMSE sections.



Fig 1. Graph of the emotional response [3]

Phase 2

An intelligent interface was implemented to extract and display linguistic markers from participants' speech during cognitive evaluations.

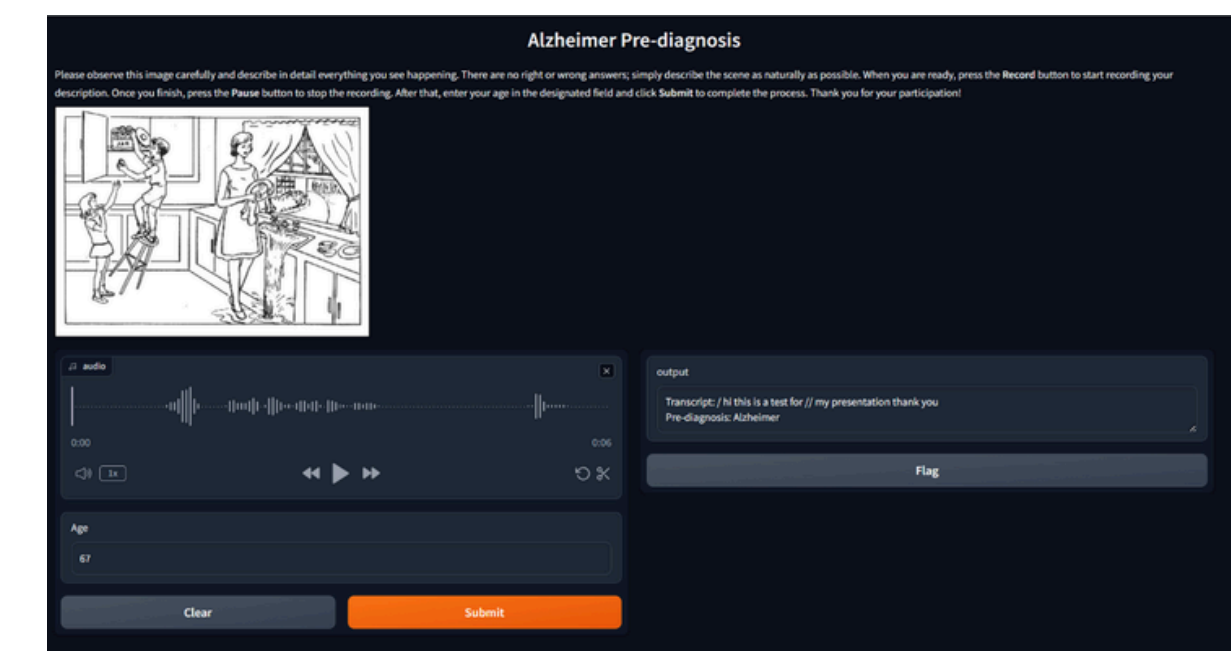


Fig 2. User interface

Phase 3

The use of motion capture is sought for gait characteristics relevant to the assessment of cognitive health

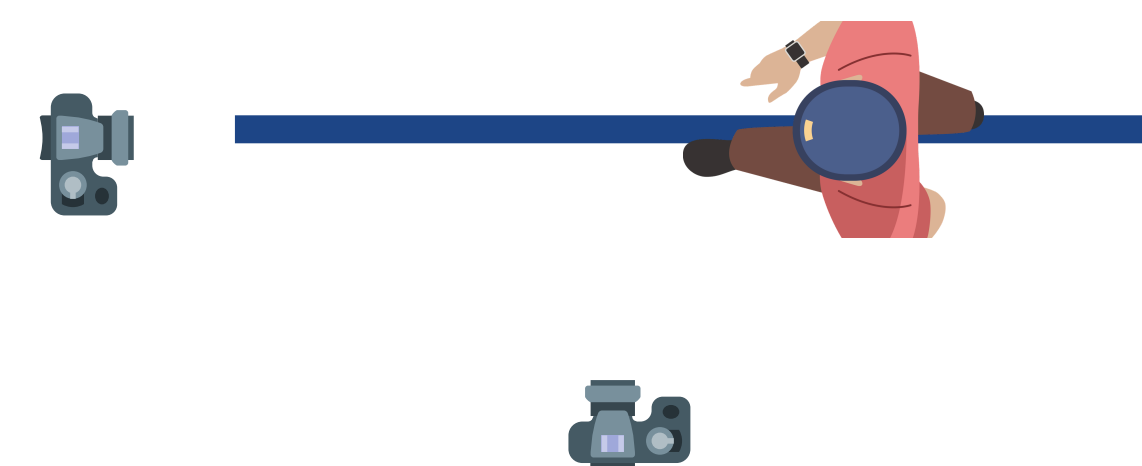


Fig 3. Schematic proposal

Conclusion

- Technological tools showed potential for assessing different dimensions of dementia-related decline.
- Technology-driven approaches can support the early identification of cognitive impairment.
- A multi-phase framework was established to enable pre-diagnostic dementia assessment through validated data acquisition and analytical methods.

References

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