INPLASY

Ecological momentary assessment and its potential contribution to physiotherapy rehabilitation: A scoping review of clinical, methodological, and technological applications in real-world contexts

INPLASY202610084

doi: 10.37766/inplasy2026.1.0084

Received: 25 January 2026

Published: 25 January 2026

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ADMINISTRATIVE INFORMATION

Support - Not applicable.

Review Stage at time of this submission - Data analysis.

Conflicts of interest - None declared.

INPLASY registration number: INPLASY202610084

Amendments - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 25 January 2026 and was last updated on 25 January 2026.

INTRODUCTION

Review question / Objective The aim of this scoping review is to map and synthesise the available evidence on the use of Ecological Momentary Assessment in physiotherapy rehabilitation by (i) describing its clinical purposes, methodological characteristics, and technological implementations in community and home contexts, and (ii) identifying key gaps to guide future research and support more consistent reporting and protocol design.

Background Physiotherapy rehabilitation is delivered across diverse care settings, including hospitals, outpatient clinics, and increasingly, patients' homes. In extra-hospital contexts, treatment adherence is a critical determinant of therapeutic effectiveness, because a substantial proportion of rehabilitation relies on the regular, sustained, and autonomous performance of prescribed exercises and self-care behaviours [1,2]. Evidence consistently indicates that higher adherence is associated with better outcomes in pain, physical function, and occupational performance. However, studies in musculoskeletal, respiratory, and chronic disease populations repeatedly report high rates of non-adherence, which remains a major barrier to effective physiotherapy rehabilitation—particularly in home-based care [3-7].

This challenge has intensified the search for approaches that can characterise and influence patients' real-world behaviours as they unfold in daily life. In this context, Ecological Momentary Assessment (EMA) represents not merely a digital tool, but a methodological framework for repeatedly capturing symptoms, behaviours, and experiences in real time within natural environments [8]. EMA leverages digital technologies such as smartphones, mobile applications, electronic diaries, and physiological sensors to collect frequent in-situ measurements across the day, thereby reducing recall bias and

improving ecological validity [8-10]. By quantifying within-person, time-varying and context-dependent fluctuations in clinically relevant variables, EMA can support a more precise understanding of patient engagement and the factors that shape adherence to rehabilitation protocols [11,12].

From a rehabilitation-technology perspective, EMA can be understood as a measurement layer within digital rehabilitation ecosystems. It complements periodic patient-reported outcome measures and clinic-based assessments by enabling continuous, context-aware monitoring of symptoms, function, and self-management behaviors in home and community settings. When delivered through smartphones, wearables, or connected assistive technologies, EMA can support telerehabilitation by informing remote clinical decision-making, tailoring exercise dosage, and enabling timely, just-in-time support within real-world contexts [8-12].

Rationale Although EMA is well established in psychology, nutrition, and chronic pain research—where it has shown feasibility, acceptability, and clinical utility—its implementation in physiotherapy remains comparatively incipient [13-16]. Existing physiotherapy-related EMA studies have focused mainly on musculoskeletal and neurological conditions, typically using small-to-moderate samples and heterogeneous protocols in terms of study design, technologies, target variables, and sampling schedules. While some studies suggest that EMA can capture clinically meaningful trajectories that are less visible in conventional pre- and post-treatment assessments—for example in osteoarthritis and chronic low back pain—the evidence base remains fragmented, with limited comparability across studies [17,18].

As a result, several knowledge gaps persist regarding how EMA has been operationalised in physiotherapy: which clinical, community, and home settings have been examined; which clinical objectives have been targeted; which platforms, technologies, and sensors have been used; what measurement burden has been imposed on patients; and how adherence to EMA protocols has been defined and reported. The absence of a consolidated synthesis of these methodological and technological features constrains knowledge translation, limits the development of reporting and design recommendations, and ultimately slows the adoption of evidence-informed digitally assisted rehabilitation approaches [20-22].

To address these gaps, this scoping review provides a structured mapping of how EMA has been implemented in physiotherapy rehabilitation research, with particular attention to protocol design features (e.g., sampling approach, prompt frequency, duration), digital platforms and sensor integration, and the way adherence is measured and reported. By consolidating these elements across studies, our synthesis aims to improve cross-study comparability and inform the design and reporting of future EMA-based rehabilitation protocols, including the development of digitally assisted interventions.

METHODS

Strategy of data synthesis A scoping review was conducted, as this design is appropriate for mapping and synthesising emerging and heterogeneous evidence. The review was developed based on the Joanna Briggs Institute (JBI) guidance for scoping reviews [23] and reported in accordance with the PRISMA Extension for Scoping Reviews (PRISMA-ScR) recommendations [24].

The search strategy was developed in line with the Peer Review of Electronic Search Strategies (PRESS) guidance [25]. A systematic search was conducted in PubMed, the Cochrane Library, Google Scholar and Scopus. Google Scholar was used as a complementary source. The general search syntax was restricted to title, abstract, and keywords fields when applicable.

A combination of controlled vocabulary (Medical Subject Headings, MeSH) and free-text terms was used, including: "ecological momentary assessment" (MeSH), "experience sampling", "physical therapy modalities" (MeSH), neurorehabilitation, and "orthopedic disorders". Terms were systematically combined using Boolean operators OR and AND, and adapted to the syntax of each database. In addition, reference lists of included studies and similar systematic reviews were hand-searched to identify additional eligible records.

The final search was performed between October and November 2025. Full search strategies for each database are reported in the supplementary materials (Appendix 2). No publication date restrictions were applied to capture all relevant evidence on EMA use. Google Scholar procedure: For Google Scholar, results were sorted by relevance and records were screened on using the same eligibility criteria applied to database records.

Eligibility criteria Population: children, adolescents, adults, and older adults, with or without health conditions.

Concept (EMA): EMA had to be implemented as: (a) instruments collecting data in real time; (b) in a natural environment; (c) repeated measures of two or more per day, meaning participants were

prompted more than once within a day; (d) self-reports or automatic records delivered via prompts (e.g., SMS, WhatsApp, alarms, or alerts); and (e) administration via electronic devices or paper-and-pencil methods, examining variables such as mood, perceived pain during the day, adherence to home therapy, or any other rehabilitation- and follow-up–related variable.
Paper-and-pencil protocols were eligible only if procedures were described to minimise retrospective reporting (e.g., time-stamped entries or scheduled entries with compliance checks).
Variables: mood, pain, motor behaviour, physical activity, adherence to home therapy, or any other variable related to rehabilitation and follow-up.
Context: studies conducted in clinical, community, and home settings.
Study types: primary studies providing original data on EMA use in rehabilitation therapies, including instrumental research and empirical research (i.e., experimental, quasi-experimental, single-case, non-experimental/observational, qualitative, and mixed-methods studies).
No exclusion criteria were applied based on sex, age, or clinical condition. The review was limited to articles published in English and Spanish. Secondary studies (e.g., systematic reviews and meta-analyses) were excluded to avoid duplication of data.

Source of evidence screening and selection Two reviewers (A.C.M. and S.Z.M.) independently screened and selected studies. Inter-rater agreement was evaluated using Cohen's kappa coefficient and the Prevalence-Adjusted Bias-Adjusted Kappa (PABAK) to account for prevalence and bias effects [26-29].
Study selection and data charting were conducted in three stages. First, duplicate records from the four databases were removed using Mendeley. Second, two reviewers applied inclusion criteria after screening titles and abstracts. Third, when decisions could not be made based on title and abstract alone, full texts were retrieved and assessed. Discrepancies were resolved by third reviewer adjudication.
Key information was charted independently by A.C.M. and S.Z.M. using a predesigned Microsoft Excel spreadsheet that underwent a pilot phase. Extracted data were subsequently synthesised and presented in tables and figures.

Data management A narrative synthesis of findings from the included studies was conducted, structured around EMA-related methods and procedures within rehabilitation research. Study selection is presented in Figure 1 using the PRISMA flow diagram [13]. Extracted information included: (a) methodological quality appraisal of included studies (Table 2); (b) general characteristics of included studies (Table 3); (c) Methodological features of EMA implementation across included studies (Table 4); and (d) adherence/compliance reported in studies using EMA (Table 5).

Reporting results / Analysis of the evidence Data will be analyzed through thematic and categorical synthesis. An inductive-deductive content analysis will be employed, combining theoretical categories with emergent subcategories. Results will be presented through frequency tables and highlighting patterns, relationships, and research gaps. Methodological quality of studies will be assessed following scoping review recommendations.
Quality assessment of included studies: Two investigators independently assessed the methodological quality of the included studies using The Quality Assessment Tool for Observational Cohort and Cross-Sectional Studies, the Quality Assessment Tool for Before-After (Pre Post) Studies with No Control Group, and The Quality Assessment of Controlled Intervention Studies.

Presentation of the results Findings will be organized in levels: General characterization of studies: descriptive table showing year, country, EMA type, implementation level, and methodological approach.
Visual representation: PRISMA-ScR flow diagram of study selection.
Integrative model summarizing key in EMA and fisioteraphy. The final report will follow PRISMA-ScR guidelines and include tables and figures.

Language restriction English and Spanish are included.

Country(ies) involved Chile.

Keywords Ecological momentary assessment; experience sampling; physiotherapy; assistive technology; telerehabilitation; remote monitoring; mHealth; wearable sensors; scoping review.

Dissemination plans The review results will be disseminated through:
• Publication of the full article in a peer-reviewed journal focused on rehabilitation
• Presentation at national and international conferences.
• Communication through national media outlets.

Contributions of each author

Author 1 - Solange Zapata-Monsalves - Conceptualization and study design (objectives, research questions, and inclusion/exclusion criteria); search and selection of studies; first reviewer; analysis and synthesis of results; drafting and revision of the final manuscript.
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Author 12 - Rafael Zapata-Lamana - Conceptualization and study design (objectives, research questions, and inclusion/exclusion criteria); search and selection of studies; third reviewer (arbiter); analysis and synthesis of results; drafting and revision of the final manuscript.
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