An Idea Health Journal
ISSN (Online) 2797-0604
Volume 5, Issue 03, 2025

# Psychometric Evaluation of a Modified Medication Adherence Scale for People Living with HIV: Evidence From a Multisite Study

**[1*] Susana Nurtanti, [2]Sri Handayani, [3]Putri Halimu Husna**
[1]Psychiatric Nursing, Akper Giri Satria Husada, Indonesia
[1]Medical Surgical Nursing, Akper Giri Satria Husada, Indonesia
[1]Maternity Nursing, Akper Giri Satria Husada, Indonesia

**ARTICLE INFO**

**Article History:**
Received :03-10-2025
Revised :03-11-2025
Accepted :24-12-2025

**Keywords :**
Medication adherence, antiretroviral therapy, psychometric validation

**Correspondence :**
Susana Nurtanti

**Email** :
susan.alkuina@yahoo.com

**ABSTRACT**

**Introduction**:Medication adherence critically determines treatment success among people living with HIV (PLHIV), especially in achieving optimal outcomes from antiretroviral therapy (ART). However, accurately measuring adherence remains challenging due to behavioral, psychological, and contextual barriers influencing patients' medication-taking practices. Reliable and valid measurement instruments are essential for clinical monitoring and research. This study evaluated the psychometric properties of a modified medication adherence scale designed to better capture adherence behaviors among PLHIV across diverse clinical settings. Methods: A cross-sectional multisite study involved 342 PLHIV receiving ART at three HIV treatment centers. The modified instrument comprised eight items adapted from established adherence scales to incorporate behavioral and contextual factors affecting adherence. Content validity was assessed through expert panel review, and construct validity was examined using exploratory factor analysis (EFA). Internal consistency reliability was evaluated using Cronbach's alpha, and item-total correlation analysis assessed individual item performance. Results: The instrument demonstrated satisfactory psychometric properties. Content validity indices were high (I-CVI range: 0.83–1.00), indicating strong expert agreement. EFA revealed a two-factor structure representing unintentional and intentional non-adherence, explaining 62.4% of the total variance. The overall scale showed good internal consistency reliability with a Cronbach's alpha of 0.82. Conclusion: These findings indicate that the modified medication adherence scale is a reliable and valid instrument for assessing ART adherence among PLHIV and may be useful for clinical assessment and research applications.

## INTRODUCTION

Antiretroviral therapy (ART) has transformed HIV from a fatal disease into a manageable condition. Consistent adherence to ART promotes viral suppression and extends the lifespan of people living with HIV (PLHIV). Global HIV strategies emphasize adherence as essential to achieving the UNAIDS 95-95-95 targets. Despite these advances, many individuals continue to face challenges in maintaining adherence.

Medication adherence constitutes a complex, multidimensional behavior influenced by patient-related, social, and healthcare system factors (3). Research demonstrates that ART adherence correlates with improved viral suppression, reduced HIV transmission, and decreased mortality rates (4). Nevertheless, psychological distress, stigma, treatment fatigue, limited social support, and systemic barriers such as access and continuity of care adversely affect adherence (5,6,7).

Behavioral theories have also highlighted the role of cognitive and motivational determinants in medication adherence. The Information–Motivation–Behavioral Skills (IMB) model suggests that adequate information, strong motivation, and behavioral skills are necessary for maintaining adherence behaviors (8,9). Empirical evidence indicates that psychosocial determinants, such as treatment beliefs, stigma, and perceived side effects, may significantly influence adherence decisions among PLHIV (10). Additionally, emerging treatment approaches, such as long-acting antiretroviral therapy, highlight the importance of monitoring adherence to ensure treatment success. (11)

Accurate measurement of medication adherence is essential for both clinical practice and research. Various methods have been employed, including electronic monitoring systems, pharmacy refill data, and biological markers. Nevertheless, self-report adherence scales remain widely utilized due to their practicality, cost-effectiveness, and feasibility in routine clinical settings (12). Systematic reviews have identified multiple validated

adherence measurement tools; however, these instruments vary in reliability, validity, and applicability across contexts (13).

Self-report adherence instruments are extensively used in HIV research to assess treatment behavior and identify patients at risk of non-adherence (14,15). However, discrepancies between self-reported and objective adherence measures underscore the necessity for improved assessment tools (16). Additionally, contextual factors such as stigma, treatment fatigue, mental health challenges, and structural barriers influence adherence (17,18).

In response to these limitations, recent research emphasizes the importance of adapting and validating adherence measurement instruments for specific populations and healthcare settings. Psychometric validation studies are essential to ensure that measurement tools accurately capture adherence behaviors while maintaining acceptable reliability and validity (19). For instance, studies evaluating adherence scales among HIV populations highlight the necessity of contextual adaptation to reflect real-world treatment barriers.

Furthermore, advances in digital health technologies and real-time medication monitoring have provided new approaches for assessing adherence behavior (20). Machine learning approaches have also been explored to predict ART adherence and identify high-risk patients (21). Despite these developments, validated self-report instruments remain an essential component of adherence assessment due to their practicality in resource-limited settings. (22)

In light of these developments and the persistent need for reliable adherence measurement, further research is required to evaluate the psychometric properties of modified adherence scales among PLHIV. Multisite validation studies are especially valuable as they enable assessment of measurement tools across diverse patient populations and clinical settings. Accordingly, this study aimed to evaluate the psychometric properties of a modified medication adherence scale among people living with HIV using a multisite clinical sample. Specifically, the study assessed the scale's content validity, construct validity, and internal consistency reliability.

## METHODS

A cross-sectional multisite study was conducted from January to June 2025 at three HIV treatment centers in Indonesia. These centers offer comprehensive HIV services, including antiretroviral therapy management, adherence counseling, and routine viral load monitoring, following international HIV treatment guidelines.

A total of 342 participants were recruited using convenience sampling. Participants were adults diagnosed with HIV who were currently receiving antiretroviral therapy. Inclusion criteria were: (1) age ≥18 years, (2) receiving ART for at least six months, and (3) willingness to participate in the study. Patients with severe cognitive impairment were excluded.

The modified medication adherence scale comprised eight items adapted from previously validated adherence instruments. These items were adjusted to better capture contextual barriers relevant to people living with HIV, including treatment fatigue, stigma-related concerns, and forgetfulness linked to daily routines. Content validity was assessed by a panel of five experts specializing in HIV care, nursing research, and public health. Each item was rated for relevance and clarity using a four-point scale. The item-level content validity index (I-CVI) and scale-level content validity index (S-CVI) were subsequently calculated.

Data analysis was performed using SPSS version 25. Construct validity was evaluated through exploratory factor analysis employing principal component extraction and varimax rotation. Sampling adequacy was assessed using the Kaiser–Meyer–Olkin (KMO) test and Bartlett's test of sphericity. Internal consistency reliability was measured by Cronbach's alpha coefficient.

## RESULT AND DISCUSSION

### RESULT

#### *Respondent Characteristics*

A total of 342 participants were included in the analysis. The mean age was 36.8 years (SD = 8.9). Approximately 61.4% of respondents were male, and 57.6% had been receiving ART for more than two years. Viral suppression at the most recent clinical visit was reported by approximately 72% of participants.

**Content Validity**

Expert evaluation demonstrated strong content validity for the modified scale. Item-level content validity indices ranged from 0.83 to 1.00, while the overall scale-level content validity index was 0.94, indicating excellent agreement among experts.

**Construct Validity**

The Kaiser–Meyer–Olkin measure of sampling adequacy was 0.84, indicating suitability for factor analysis. Bartlett's test of sphericity was significant ($\chi^2 = 721.45$, $p < .001$).

Exploratory factor analysis identified two factors explaining 62.4% of the total variance. The first factor represented unintentional non-adherence, including items related to forgetfulness and routine disruptions. The second factor represented intentional non-adherence, including items related to treatment fatigue and concerns about medication side effects.

**Table 1. Factor Loadings of the Modified Medication Adherence Scale**

| Item | Factor 1 | Factor 2 |
|---|---|---|
| Item 1 | 0.71 | 0.24 |
| Item 2 | 0.69 | 0.18 |
| Item 3 | 0.64 | 0.21 |
| Item 4 | 0.58 | 0.30 |
| Item 5 | 0.19 | 0.72 |
| Item 6 | 0.25 | 0.70 |
| Item 7 | 0.31 | 0.68 |
| Item 8 | 0.28 | 0.66 |

**Reliability**

The overall Cronbach's alpha coefficient for the modified scale was 0.82, indicating good internal consistency. The two subscales demonstrated Cronbach's alpha values of 0.79 and 0.77, respectively. Item-total correlations ranged from 0.45 to 0.71.

## DISCUSSION

This study evaluated the psychometric properties of a modified medication adherence scale among people living with HIV across multiple clinical sites. The findings indicate that the modified scale demonstrated satisfactory validity and reliability for assessing ART adherence behaviors. Reliable adherence measurement is essential for monitoring treatment outcomes and identifying patients who may require additional adherence support (6,23,24).

The results demonstrated strong content validity for the modified scale, indicating that the instrument adequately captures adherence-related behaviors relevant to PLHIV. The involvement of experts in HIV care and public health research contributed to ensuring the clinical relevance and clarity of the scale items. Similar psychometric validation studies have emphasized the importance of expert evaluation during instrument adaptation to ensure conceptual alignment with patient experiences(19).

The exploratory factor analysis revealed a two-factor structure representing intentional and unintentional non-adherence. This finding aligns with contemporary theoretical models of medication adherence that conceptualize adherence behavior as a multidimensional construct (3). Unintentional non-adherence often results from practical barriers such as forgetfulness or disruptions in daily routines, whereas intentional non-adherence may be associated with treatment beliefs, perceived side effects, or psychological factors.

Previous studies have reported similar multidimensional patterns of adherence behavior among PLHIV. For instance, psychosocial factors such as stigma, depression, and treatment fatigue have been shown to influence adherence decisions (25)((5). Mental health challenges and cognitive burden associated with chronic disease management may also contribute to treatment interruptions(17). These findings highlight the importance of addressing both behavioral and psychological determinants when designing adherence interventions.

The reliability analysis further demonstrated acceptable internal consistency for the modified scale. The Cronbach's alpha coefficient exceeded the commonly recommended threshold for reliability, indicating that the scale items measure a coherent construct. These findings are consistent with previous systematic reviews reporting acceptable reliability for self-report adherence instruments used in chronic disease and HIV populations(6,12,23).

Accurate adherence measurement is also important for evaluating the effectiveness of clinical interventions. Evidence suggests that targeted behavioral interventions, including cognitive behavioral therapy and adherence counseling, can significantly improve ART adherence among PLHIV(26). In addition, digital adherence monitoring systems and real-time medication reminders have shown promise in supporting treatment adherence and viral suppression (20).

The identification of distinct adherence dimensions in the present study may also inform the development of tailored adherence interventions. For example, reminder systems or digital adherence technologies may address unintentional non-adherence, while counseling interventions may be more appropriate for addressing intentional non-adherence driven by beliefs or stigma. These approaches are consistent with behavioral frameworks such as the Information Motivation Behavioral Skills model, which highlights the importance of knowledge, motivation, and behavioral skills in promoting adherence behaviors (8)(9).

This study has several strengths. The multisite design enhances the generalizability of the findings across different clinical settings, while the relatively large sample size strengthens the robustness of the psychometric analysis. Additionally, the study contributes to the growing body of literature examining adherence measurement tools among PLHIV, which remains an important area of research for improving HIV treatment outcomes.

Nevertheless, several limitations should be acknowledged. First, the cross-sectional design did not allow assessment of test–retest reliability. Second, adherence was measured using self-report, which may be subject to recall bias or social desirability bias. Previous research has highlighted discrepancies between self-reported adherence and objective adherence measures such as electronic monitoring or pharmacy refill data (16). Future studies should therefore evaluate the predictive validity of the modified scale by examining its association with viral load outcomes and other clinical indicators of treatment success.

## CONCLUSION

The modified medication adherence scale demonstrated strong psychometric properties in a multisite sample of people living with HIV. The scale showed good content validity, acceptable construct validity, and satisfactory internal consistency reliability. These findings suggest that the instrument may serve as a useful tool for assessing ART adherence in both clinical practice and research settings. Future studies should further evaluate the scale's predictive validity and applicability across different populations and healthcare contexts.

## ACKNOWLEDGMENTS

The authors would like to express their sincere gratitude to all participants who generously contributed their time and experiences to this study. We also acknowledge the healthcare professionals and administrative staff at the participating hospitals and HIV care clinics involved in the multisite data collection process for their valuable assistance and support. Their cooperation greatly facilitated the successful implementation of this research. The authors are also thankful to the research assistants and field enumerators who contributed to data collection, data management, and preliminary analysis. In addition, we appreciate the constructive feedback from colleagues and peer reviewers whose insights helped improve the quality and clarity of this manuscript. Finally, the authors acknowledge the institutional support provided by the affiliated universities and research centers that enabled the completion of this study on the psychometric evaluation of the modified medication adherence scale among people living with HIV.

**AUTHOR CONTRIBUTIONS:** S.N. : Conceptualization, methodology, investigation, writing original draft, project administration. S.H. : Conceptualization, supervision, funding acquisition, writing review and editing.P.H.: Formal analysis, visualization, data collection, investigation, data curation. All authors approved the final manuscript.

**CONFLICTS OF INTEREST:** The authors declare no conflict of interest

**FUNDING:** This research received no external funding.

## REFERENCES

1. Unaids. 2024 global AIDS report — The Urgency of Now: AIDS at a Crossroads [Internet]. 2024. Report. Available from: http://www.wipo.int/
2. The path that ends AIDS: UNAIDS Global AIDS Update 2023 [Internet]. Report. Available from: http://www.wipo.int/amc/en/mediation/rules
3. Vrijens B, De Geest S, Hughes DA, Przemyslaw K, Demonceau J, Ruppar T, et al. A new taxonomy for describing and defining adherence to medications. Br J Clin Pharmacol. 2012 May;73(5):691–705. doi:10.1111/j.1365-2125.2012.04167.x PubMed PMID: 22486599.
4. Mills EJ, Nachega JB, Buchan I, Orbinski J, Attaran A, Singh S, et al. Adherence to antiretroviral therapy in sub-Saharan Africa and North America: A meta-analysis. JAMA. American Medical Association; 2006. p. 679–90. doi:10.1001/jama.296.6.679 PubMed PMID: 16896111.
5. Remien RH, Stirratt MJ, Nguyen N, Robbins RN, Pala AN, Mellins CA. Mental health and HIV/AIDS: The need for an integrated response. AIDS. Lippincott Williams and Wilkins; 2019. p. 1411–20. doi:10.1097/QAD.0000000000002227 PubMed PMID: 30950883.
6. Nachega JB, Scarsi KK, Gandhi M, Scott RK, Mofenson LM, Archary M, et al. Long-acting antiretrovirals and HIV treatment adherence. The Lancet HIV. Elsevier Ltd; 2023. p. e332–42. doi:10.1016/S2352-3018(23)00051-6 PubMed PMID: 37062293.
7. Rintamaki LS, Davis TC, Skripkauskas S, Bennett CL, Wolf MS. Social Stigma Concerns and HIV Medication Adherence. AIDS PATIENT CARE and STDs. 2006. Report.
8. Amico KR, Toro-Alfonso J, Fisher JD. An empirical test of the Information, Motivation and Behavioral Skills model of antiretroviral therapy adherence. AIDS Care - Psychological and Socio-Medical Aspects of AIDS/HIV. 2005 Aug;17(6):661–73. doi:10.1080/09540120500038058 PubMed PMID: 16036253.
9. Amico KR, Barta W, Konkle-Parker DJ, Fisher JD, Cornman DH, Shuper PA, et al. The information-motivation-behavioral skills model of ART adherence in a deep south HIV+ clinic sample. AIDS Behav. 2009 Feb;13(1):66–75. doi:10.1007/s10461-007-9311-y PubMed PMID: 17876697.
10. Kalichman SC, Kalichman MO, Eaton LA. Phone-Delivered Intervention to Improve HIV Care for Young People Living With HIV: Trial to Inform Implementation and Utility [Internet]. 2023. Report. Available from: http://links.lww.com/QAI/C105
11. Neves RS, Lacerda JM, Cordeiro RB, de Sá Galina VS, de Araújo DCSA, Rocha KSS. Knowledge and stigma of people living with HIV treated in a medication dispensing unit: a cross-sectional study. BMC Public Health. 2025 Dec 1;25(1). doi:10.1186/s12889-025-23244-8 PubMed PMID: 40604670.
12. Horvath KJ, Lammert S, Erickson D, Rivet Amico K, Talan AJ, Shalhav O, et al. A Web-Based Antiretroviral Therapy Adherence Intervention (Thrive With Me) in a Community-Recruited Sample of Sexual Minority Men Living With HIV: Results of a Randomized Controlled Study. J Med Internet Res. 2024;26. doi:10.2196/53819 PubMed PMID: 39348677.
13. Smith R, Villanueva G, Probyn K, Sguassero Y, Ford N, Orrell C, et al. Accuracy of measures for antiretroviral adherence in people living with HIV. Cochrane Database of Systematic Reviews. John Wiley and Sons Ltd; 2022. doi:10.1002/14651858.CD013080.pub2 PubMed PMID: 35871531.
14. Langebeek N, Gisolf EH, Reiss P, Vervoort SC, Hafsteinsdóttir TB, Richter C, et al. Predictors and correlates of adherence to combination antiretroviral therapy (ART) for chronic HIV infection: a meta-analysis [Internet]. 2014. Report. Available from: http://www.biomedcentral.com/1741-7015/12/142
15. Ngowi KM, Minja L, Boer IMS de, Aarnoutse RE, Masika L, Sprangers MAG, et al. Predicting viral load suppression by self-reported adherence, pharmacy refill counts and real time medication monitoring among people living with HIV in Tanzania. AIDS Res Ther. 2022 Dec 1;19(1). doi:10.1186/s12981-022-00475-y PubMed PMID: 36380383.
16. Liao H, Lyon CJ, Ying B, Hu T. Climate change, its impact on emerging infectious diseases and new technologies to combat the challenge. Emerging Microbes and Infections. Taylor and Francis Ltd.; 2024. doi:10.1080/22221751.2024.2356143 PubMed PMID: 38767202.
17. Arashiro P, Maciel CG, Freitas FPR, Koch GSR, da Cunha JCP, Stolf AR, et al. Adherence to antiretroviral therapy in people living with HIV with moderate or severe mental disorder. Sci Rep. 2023 Dec 1;13(1). doi:10.1038/s41598-023-30451-z PubMed PMID: 36864110.

18. Johnson MJ, Rutterford L, Sunny A, Pask S, de Wolf-Linder S, Murtagh FEM, et al. Benefits of specialist palliative care by identifying active ingredients of service composition, structure, and delivery model: A systematic review with meta-analysis and meta-regression. PLoS Med. 2024 Aug 1;21(8). doi:10.1371/journal.pmed.1004436 PubMed PMID: 39093900.
19. Golub IS, Termeie OG, Kristo S, Schroeder LP, Lakshmanan S, Shafter AM, et al. Major Global Coronary Artery Calcium Guidelines. JACC: Cardiovascular Imaging. Elsevier Inc.; 2023. p. 98–117. doi:10.1016/j.jcmg.2022.06.018 PubMed PMID: 36599573.
20. Mwalabu G, Msosa A, Tjoflåt I, Urstad KH, Bø B, Furskog-Risa EC, et al. Simulation-Based Education as a Solution to Challenges Encountered with Clinical Teaching in Nursing and Midwifery Education in Malawi: A Qualitative Study. J Nurs Manag. 2024;2024. doi:10.1155/2024/1776533 PubMed PMID: 40224831.
21. Yeneakal KA, Teferi GH, Mihret TT, Mengistu AK, Tizie SB, Tadele MM. Predicting antiretroviral therapy adherence status of adult HIV-positive patients using machine-learning Northwest, Ethiopia, 2025. BMC Med Inform Decis Mak. 2025 Dec 1;25(1). doi:10.1186/s12911-025-03106-4 PubMed PMID: 40640758.
22. García-Muñoz AM, Victoria-Montesinos D, Cerdá B, Ballester P, de Velasco EM, Zafrilla P. Self-Reported Medication Adherence Measured with Morisky Scales in Rare Disease Patients: A Systematic Review and Meta-Analysis. Healthcare (Switzerland). MDPI; 2023. doi:10.3390/healthcare11111609
23. Simoni JM, Amico KR, Smith L, Nelson K. Antiretroviral adherence interventions: Translating research findings to the real world clinic. Current HIV/AIDS Reports. 2010. p. 44–51. doi:10.1007/s11904-009-0037-5 PubMed PMID: 20425057.
24. Nachega JB, Uthman OA, Del Rio C, Mugavero MJ, Rees H, Mills EJ. Addressing the achilles' heel in the HIV care continuum for the success of a test-and-treat strategy to achieve an AIDS-free generation. Clinical Infectious Diseases. 2014 Jul 1;59(SUPPL.1). doi:10.1093/cid/ciu299 PubMed PMID: 24926028.
25. Kalichman SC, Eaton LA, Kalichman MO, Sam SS, Caliendo AM. Prepandemic Predictors of Medication Adherence and HIV Viral Load During the First Year of COVID-19 [Internet]. 2022. Report. Available from: www.jaids.com
26. Safren SA, O'Cleirigh C, Tan JY, Raminani SR, Reilly LC, Otto MW, et al. A Randomized Controlled Trial of Cognitive Behavioral Therapy for Adherence and Depression (CBT-AD) in HIV-Infected Individuals. Health Psychology. 2009 Jan;28(1):1–10. doi:10.1037/a0012715 PubMed PMID: 19210012.