

## Cognitive Decline and ADL Independence in Older Adults: A Systematic Review

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### Abstract

**Background:** Cognitive decline is prevalent among older adults and is associated with decreased independence in activities of daily living (ADL).

**Objective:** To systematically review the association between cognitive decline and ADL independence in older adults.

**Methods:** This systematic review followed PRISMA 2020 guidelines. Literature searches were conducted in PubMed, ScienceDirect, and Google Scholar for studies published between 2021 and 2026. Eligible studies included older adults aged  $\geq 60$  years assessing cognitive function and ADL independence. A qualitative synthesis was performed due to heterogeneity. Risk of bias was assessed using an adapted Newcastle–Ottawa Scale for cross-sectional studies.

**Results:** Five cross-sectional studies with sample sizes ranging from approximately 60 to over 10,000 participants were included. Cognitive function was assessed using standardized tools such as the Mini-Mental State Examination (MMSE), while ADL was measured using instruments such as the Barthel Index. All studies reported a consistent association between cognitive impairment and reduced ADL independence. However, quantitative effect measures (e.g., odds ratios, confidence intervals) were not consistently reported. Risk of bias assessment indicated moderate to high risk across most studies.

**Conclusion:** Cognitive decline is associated with reduced ADL independence in older adults. However, the strength of evidence is limited due to study design, lack of quantitative synthesis, and risk of bias in included studies.

### Keywords

Cognitive Dysfunction; Activities of Daily Living; Aged; Cognitive Impairment

### Introduction

Population aging represents a major global demographic transition, with the number of individuals aged  $\geq 65$  years projected to reach approximately 1.5 billion by 2050.<sup>1</sup> This shift is accompanied by a growing prevalence of age-related conditions, particularly cognitive decline, which constitutes a significant public health concern. Cognitive decline encompasses impairments in multiple domains, including memory, attention, executive function, and visuospatial ability, and may progress to more severe conditions such as dementia.<sup>2</sup>

From a neurobiological perspective, cognitive decline is associated with structural and functional changes in the brain, including neuronal loss, synaptic dysfunction, oxidative stress, and neurotransmitter imbalance.<sup>3</sup> These alterations impair higher-order cognitive processes, such as decision-making, planning, and behavioral regulation, which are essential for maintaining independence in daily life. Consequently, cognitive impairment is not only a neurological issue but also a functional determinant that directly influences an individual's ability to perform routine activities.

Activities of daily living (ADL) represent a fundamental indicator of functional independence in older adults, encompassing essential self-care tasks such as bathing, dressing, eating, toileting, and mobility.<sup>4</sup> Declines in ADL performance are strongly associated with increased dependency, higher risk of institutionalization, and reduced quality of life.<sup>5</sup> Therefore, understanding factors that contribute to ADL decline is crucial for developing effective interventions aimed at preserving independence in older populations.

A growing body of literature suggests a significant association between cognitive function and ADL performance. Individuals with cognitive impairment often experience difficulties in executing sequential tasks, maintaining attention, and adapting to environmental demands, all of which are necessary for independent functioning.<sup>6</sup> Moreover, emerging evidence highlights the role of interacting factors, such as physical frailty, psychological status, and social participation, in modulating the relationship between cognitive decline and functional independence.<sup>7</sup> These multidimensional influences indicate that the relationship between cognitive function and ADL is complex and cannot be fully explained by a single domain.

Despite the increasing number of studies on this topic, several limitations persist in the existing literature. First, many studies employ cross-sectional designs, which limit the ability to establish causal relationships between cognitive decline and ADL outcomes. Second, there is considerable heterogeneity in measurement tools used to assess cognitive function and ADL, leading to inconsistencies in reported findings. Third, a substantial proportion of available studies are derived from local or non-indexed sources, with limited representation in high-quality international journals. Furthermore, recent systematic reviews that comprehensively synthesize current evidence particularly those focusing on the interaction between cognitive decline and ADL independence in older adults remain limited.

Given these gaps, a systematic synthesis of recent evidence is needed to clarify the nature and consistency of the association between cognitive decline and ADL independence. Such an analysis is important not only for advancing scientific understanding but also for informing clinical practice, particularly in fields such as physiotherapy and geriatric care, where maintaining functional independence is a primary goal. Therefore, this study aims to systematically review and synthesize current evidence on the relationship between cognitive decline and ADL independence in older adults.

## Methods

This study employed a systematic review design conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 guidelines. The review aimed to synthesize current evidence regarding the association between cognitive decline and independence in activities of daily living (ADL) among older adults.

A structured search strategy was implemented across three electronic databases: ScienceDirect, PubMed, and Google Scholar. The search covered studies published between January 2021 and April 2026 to ensure the inclusion of recent evidence. Keywords and their combinations included “cognitive decline,” “cognitive impairment,” “activities of daily living,” “ADL,” and “elderly.” Boolean operators (AND, OR) were applied to refine the search, for example: (“cognitive impairment” OR “cognitive decline”) AND (“activities of daily living” OR “ADL”) AND (“elderly” OR “older adults”). The search strategy was adapted for each database to ensure sensitivity and specificity. The detailed search syntax for PubMed was: (“cognitive impairment”[Title/Abstract] OR “cognitive decline”[Title/Abstract]) AND (“activities of daily living”[Title/Abstract] OR “ADL”[Title/Abstract]) AND (“older adults”[Title/Abstract] OR “elderly”[Title/Abstract]).

The eligibility criteria were defined using a PICO framework. The population (P) included older adults aged 60 years or older. The exposure (I/E) was cognitive decline or cognitive impairment, assessed using standardized cognitive instruments. The comparison (C), when available, included older adults with normal cognitive function. The outcome (O) was independence in ADL, measured using validated tools. Studies were included if they employed quantitative designs and reported an association between cognitive function and ADL. Studies were excluded if they were editorials, narrative reviews, commentaries, or did not provide full-text access.

The study selection process was conducted in several stages. Initially, a total of 200 records were identified (ScienceDirect: n = 22; PubMed: n = 20; Google Scholar: n = 158). After removal of duplicates (n = 100), 100 records remained for title and abstract screening. Following this screening, 79 records were excluded due to irrelevance to the research focus. A total of 21 full-text articles were assessed for eligibility. Of these, 10 articles were excluded due to not meeting inclusion criteria, resulting in 11 eligible studies. After further screening based on methodological relevance and completeness of data, five studies were included in the final qualitative synthesis.

Data extraction was performed using a standardized approach to ensure consistency across studies. Extracted variables included author, publication year, country, study design, sample size, participant characteristics, cognitive assessment tools, ADL measurement instruments, and key findings related to the association between cognitive function and ADL independence.

Cognitive function in the included studies was commonly assessed using validated instruments such as the Mini-Mental State Examination (MMSE), which has demonstrated acceptable validity and reliability in older populations. Independence in ADL was typically measured using standardized scales such as the Barthel Index, which evaluates performance in basic daily activities and has been widely validated in geriatric populations. Data extraction was conducted using a predefined standardized form including author, year, country, study design, sample size, participant characteristics, cognitive assessment tools, ADL instruments, and statistical outcomes (if available).

Risk of bias was assessed using an adapted Newcastle–Ottawa Scale for cross-sectional studies. The assessment included domains of selection bias, measurement validity, control of confounding, and statistical reporting. Due to incomplete reporting in primary studies, several domains were classified as “not reported” or “unclear.”

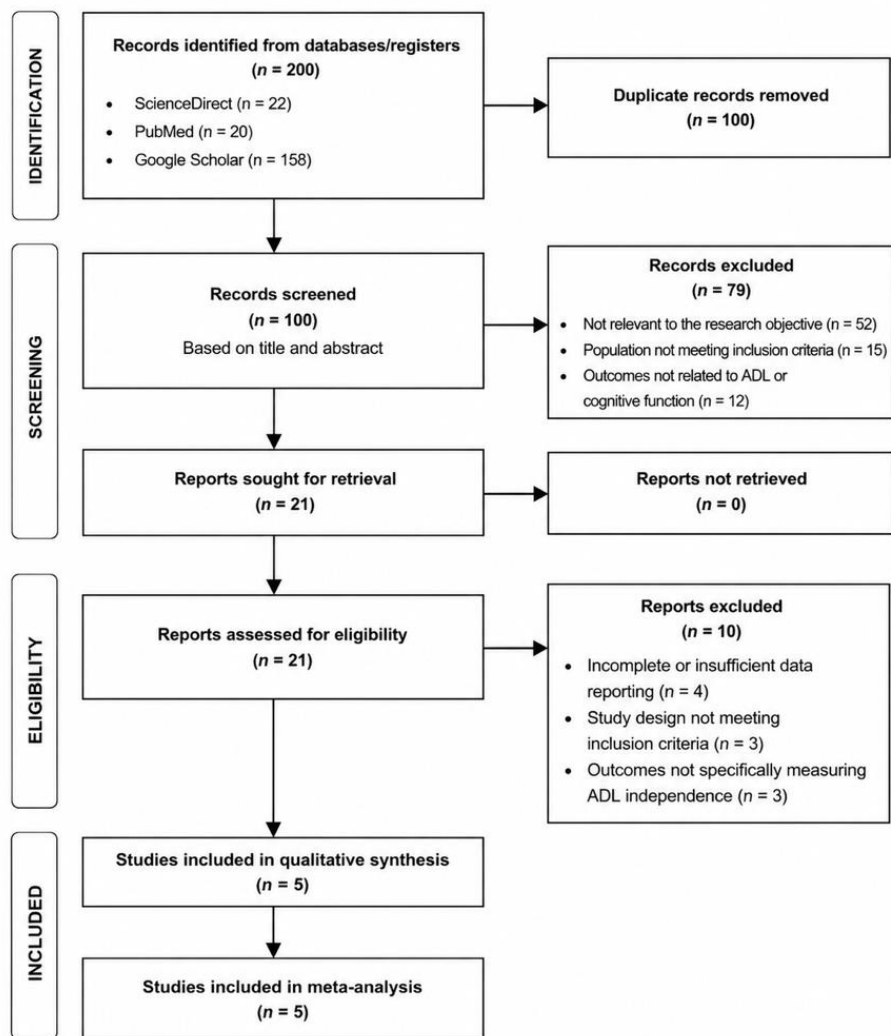
Given the heterogeneity in study populations, measurement tools, and reported outcomes, a meta-analysis was not feasible. Therefore, a qualitative synthesis was conducted to summarize the direction and consistency of the association between cognitive decline and ADL independence. No statistical pooling, effect size estimation (e.g., odds ratios or relative risks), or heterogeneity analysis ( $I^2$ ) was performed. No meta-analysis, heterogeneity assessment, or publication bias analysis was conducted due to variability in study design and lack of consistent statistical reporting.

As this study was based exclusively on previously published literature, ethical approval was not required. However, all included studies were assumed to have adhered to ethical standards as approved by their respective institutions. This review was not registered in PROSPERO. This limitation may affect transparency and reproducibility.

## Results

The results of this systematic review are presented to describe the study selection process and the characteristics and main findings of the included studies examining the association between cognitive decline and independence in activities of daily living (ADL) among older adults.

The study selection process can be seen in Figure 1. The literature search identified a total of 200 records from three electronic databases, namely ScienceDirect (n = 22), PubMed (n = 20), and Google Scholar (n = 158). After the removal of duplicate records (n = 100), 100 studies remained for title and abstract screening. During the screening process, 79 records were excluded due to irrelevance to the study objective, inappropriate population characteristics, or outcomes not related to activities of daily living (ADL) and cognitive function. Subsequently, 21 full-text articles were assessed for eligibility. Of these, 10 articles were excluded because they did not meet the predefined inclusion criteria. Finally, five studies fulfilled all eligibility requirements and were included in the qualitative synthesis.



**Figure 1.** PRISMA 2020 Flow Diagram of Study Selection Process for Systematic Review and Meta-analysis

All included studies employed a cross-sectional design and investigated older adult populations aged ≥60 years. Sample sizes varied considerably, ranging from approximately 60 participants to more than 10,000 individuals. The studies were conducted in different geographical settings, including Indonesia, India, and China. To provide a structured overview of the included studies, Table 1 summarizes the key characteristics, including study design, population, exposure, outcome measures, and main findings.

**Table 1.** Characteristics of Included Studies Examining Cognitive Function and ADL Independence

Author	Country	Study Design	Sample Size	Population Characteristics	Cognitive Assessment Tool	ADL Measurement Tool	Main Findings	Statistical Results
Riasmini et al. (2025) <sup>8</sup>	Indonesia	Cross sectional	Not reported	Older adults	Cognitive impairment assessment (not specified)	BADL	Cognitive impairment was associated with decreased independence in BADL among older adults	Significant association reported
Zahroh et al. (2024) <sup>9</sup>	Indonesia	Cross sectional	Not reported	Older adults	Cognitive function assessment (not specified)	ADL	Cognitive function was significantly related to the level of ADL independence in older adults	Significant association reported
Setyawan et al. (2025) <sup>10</sup>	Indonesia	Cross sectional	Not reported	Older adults	Cognitive impairment assessment (not specified)	ADL	Cognitive impairment affected Activity of Daily Living performance in older adults	Significant association reported
Panghal et al. (2022) <sup>11</sup>	India	Cross sectional	Approximately 200 participants	Older adults in North India	Standardized cognitive assessment tool	ADL	Cognitive impairment was associated with reduced ADL ability among older adults	Significant association reported
Li et al. (2025) <sup>12</sup>	China	Cross sectional	>10,000 older adults	Community dwelling older adults	Cognitive function assessment	ADL	Cognitive function was associated with ADL; social participation acted as a mediator and intergenerational support as a moderator	Significant association reported

None of the included studies consistently reported quantitative effect measures such as odds ratios, regression coefficients, or confidence intervals, limiting quantitative interpretation.

As shown in Table 1, all studies consistently reported a significant association between cognitive function and ADL independence. Older adults with cognitive impairment exhibited lower levels of independence in performing daily activities compared to those with normal cognitive function.

None of the included studies reported pooled effect sizes, confidence intervals, or regression coefficients in a manner that allowed quantitative comparison across studies. Additionally, subgroup analyses based on demographic or clinical characteristics were not consistently performed. To further evaluate the methodological quality of the included studies, a structured risk of bias assessment was conducted using an adapted Newcastle–Ottawa Scale for cross-sectional studies. This assessment focused on key domains, including selection bias, representativeness of the study population, validity of cognitive and ADL measurements, control of confounding variables, and adequacy of statistical reporting.

Given the variability and limited reporting across studies, several domains could not be fully assessed and were categorized as “not reported” or “unclear.” Therefore, the results of this assessment should be interpreted with caution. The detailed evaluation of risk of bias for each included study is presented in Table 2.

**Table 2.** Risk of Bias Assessment of Included Studies Using an Adapted Newcastle–Ottawa Scale for Cross-Sectional Studies

Study	Selection Bias	Representativeness	Cognitive Measurement	ADL Measurement	Confounding Control	Statistical Reporting	Overall Risk
Riasmini et al. (2025) <sup>8</sup>	Not reported	Not reported	Not reported	Reported	Not reported	Not reported	High
Zahroh et al. (2024) <sup>9</sup>	Not reported	Not reported	Not reported	Reported	Not reported	Not reported	High
Setyawan et al. (2025) <sup>10</sup>	Not reported	Not reported	Not reported	Reported	Not reported	Not reported	High
Panghal et al. (2022) <sup>11</sup>	Unclear	Unclear	Standardized	Reported	Not reported	Limited	Moderate–High
Li et al. (2025) <sup>12</sup>	Adequate	Adequate	Standardized	Reported	Partial	Reported	Moderate

The risk of bias assessment indicated that most studies had a high risk of bias due to incomplete reporting of key methodological components. Only one study demonstrated relatively stronger methodological rigor. These limitations reduce confidence in the overall findings. This review is limited by the absence of comprehensive statistical reporting, lack of meta-analysis, and moderate to high risk of bias across included studies. Additionally, the predominance of cross-sectional designs limits causal interpretation.

**Discussion**

This systematic review synthesizes current evidence on the association between cognitive decline and independence in activities of daily living (ADL) among older adults. Across all included studies, a consistent pattern emerged indicating that reduced cognitive function is associated with lower levels of independence in performing daily activities. Although the included studies varied in sample size and geographical context, the direction of the association remained uniform, suggesting that cognitive decline represents a key determinant of functional dependence in older populations.

From a neurobiological perspective, the observed association can be explained by age-related structural and functional changes in the brain. Cognitive decline is characterized by neuronal loss, synaptic degeneration, and dysregulation of neurotransmitter systems, particularly those involved in executive function and motor planning.<sup>13</sup> These impairments disrupt the integration of cognitive and motor processes required for performing ADL, such as sequencing tasks, maintaining attention, and adapting behavior to environmental demands.<sup>14</sup> As a result, individuals with cognitive impairment often experience difficulty in executing even basic self-care activities independently. These findings are consistent with previous international systematic reviews, although the overall evidence remains limited in methodological rigor.<sup>15</sup>

The findings of this review are consistent with broader geriatric research, which demonstrates that cognitive impairment is closely linked to functional decline and increased dependency.<sup>16</sup> Previous studies have shown that deficits in executive function and memory are strong predictors of reduced ADL performance, particularly in tasks requiring planning and decision-making.<sup>17</sup> In addition, recent large-scale studies suggest that the relationship between cognitive function and ADL is not purely direct but may be mediated by other factors, including social participation and intergenerational support.<sup>12</sup> This multidimensional interaction highlights the importance of considering cognitive decline within a broader biopsychosocial framework.

Beyond cognitive impairment itself, several interacting factors may influence the degree of ADL independence. Physical frailty, for example, has been identified as a significant contributor to functional decline, often exacerbating the impact of cognitive deficits.<sup>18</sup> Similarly, psychological factors such as depression and social isolation may further reduce motivation and engagement in daily activities.<sup>19</sup> These findings suggest that functional independence in older adults is determined by a complex interplay of cognitive, physical, and psychosocial domains, rather than a single determinant.

Despite the consistency of findings, several methodological limitations must be considered. First, all included studies employed cross-sectional designs, which preclude causal inference and limit the ability to determine the temporal relationship between cognitive decline and ADL impairment. Second, there was substantial heterogeneity in the measurement of both cognitive function and ADL, with different instruments and thresholds used across studies. This variability reduces comparability and may introduce measurement bias. Third, none of the studies reported standardized effect sizes or conducted multivariate analyses in a consistent manner, limiting the ability to assess the magnitude of the observed associations. The predominance of studies with high risk of bias further limits the strength and generalizability of the findings.

In addition, the absence of formal risk of bias assessment and quality grading represents a significant limitation of this review. Potential sources of bias include selection bias, particularly in studies using non-representative samples, and confounding bias due to unmeasured variables such as comorbidities, educational level, and socioeconomic status. These factors may influence both cognitive function and ADL performance, thereby affecting the observed association. The lack of publication bias assessment further limits confidence in the completeness of the evidence base.

From a clinical perspective, the findings of this review have important implications, particularly in the context of physiotherapy and geriatric rehabilitation. Early identification of cognitive decline is essential to prevent or delay functional deterioration. Interventions that integrate cognitive training, physical exercise, and social engagement may be more effective in maintaining ADL independence compared to single-domain approaches. Physiotherapy interventions should integrate cognitive and functional training

approaches to optimize independence in older adults. These strategies align with a holistic model of care that addresses the multidimensional needs of older adults.

Future research should focus on longitudinal and interventional study designs to clarify causal relationships and evaluate the effectiveness of targeted interventions. The use of standardized and validated measurement tools for both cognitive function and ADL is also essential to improve comparability across studies. Furthermore, future systematic reviews should incorporate formal risk of bias assessment and, where possible, conduct meta-analyses to provide quantitative estimates of effect size.

## Conclusion

This systematic review demonstrates a consistent association between cognitive decline and reduced independence in activities of daily living (ADL) among older adults. Individuals with impaired cognitive function tend to exhibit greater dependence in performing essential daily activities, highlighting the importance of cognitive health in maintaining functional independence.

However, the strength of evidence remains limited due to cross-sectional designs, absence of quantitative synthesis, and moderate to high risk of bias. Therefore, the findings should be interpreted as indicative of an association rather than a causal relationship.

From a practical perspective, early identification of cognitive decline and the implementation of integrated interventions targeting cognitive, physical, and psychosocial domains are essential to preserve independence and improve quality of life in older adults. Future research should prioritize longitudinal and interventional designs, incorporate standardized assessment tools, and report quantitative effect measures to strengthen the evidence base and support clinical decision-making.

## Author Contribution

Zahra Gusna Putri: Conceptualization, Methodology, Investigation, Data Curation, Formal Analysis, Writing Original Draft, Writing Review and Editing, Visualization, and Supervision.

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## Conflict of Interest Statement

The author declares no conflict of interest.

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## Ethics Statement

This study is a systematic review based on previously published articles and does not involve direct interaction with human or animal subjects. All included studies are assumed to have adhered to ethical standards as approved by their respective institutions.

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