

Literature Review**Assessment tools of olfactory dysfunction: a systematic review****Dinda Amalia Okvie Putri, Heri Kristianto, Rinik Eko Kapti**Department of Nursing, Faculty of Health Sciences, Universitas Brawijaya, Malang,
Indonesia**ABSTRACT**

Background: The sense of smell plays a vital role in detecting odors and influences daily functioning and quality of life. Olfactory function can be assessed using subjective approaches, including self-reported questionnaires for individuals with olfactory disorders. **Purpose:** To summarize and categorize existing olfactory-related scales and questionnaires, based on previous research. **Method:** A systematic search was conducted following the PRISMA guidelines using ScienceDirect, ProQuest, and PubMed. Studies published between 2014 and 2024 were screened based on predefined criteria, and 10 eligible articles were included. **Result:** The instruments were classified into three categories: assessment of olfactory function and dysfunction; olfaction-related quality of life; and attitudes, emotional responses, and the perceived importance of smell. Reported reliability values ranged from acceptable to excellent, with Cronbach's alpha coefficients between 0.65 and 0.98. Olfactory Disorders Questionnaire (ODQ) and the Taste and Smell Tool for Evaluation (TASTE) consist of more than 30 items, and may require longer completion time, which limiting routine clinical use, and provide limited evidence of predictive validity for evaluating the effectiveness of clinical interventions. **Conclusion:** This review highlighted a wide range of validated olfactory-related questionnaires, emphasizing the affective, emotional, and quality-of-life impacts of olfactory dysfunction. These instruments offer valuable subjective insights, which can complement objective olfactory testing in clinical practice and research.

Keywords: assessment, olfactory, questionnaire, scale**ABSTRAK**

Latar belakang: Indra penciuman berperan penting dalam mendeteksi bau serta memengaruhi fungsi sehari-hari dan kualitas hidup. Penilaian fungsi penciuman dapat dilakukan melalui metode subjektif, salah satunya menggunakan kuesioner yang diisi sendiri oleh pasien dengan gangguan penciuman. **Tujuan:** Untuk merangkum dan mengelompokkan berbagai skala serta kuesioner yang terkait penciuman berdasarkan penelitian sebelumnya. **Metode:** Pencarian literatur dilakukan mengikuti pedoman PRISMA menggunakan ScienceDirect, ProQuest, dan PubMed, untuk artikel tahun 2014–2024. Didapati sebanyak 10 artikel memenuhi kriteria untuk dianalisis. **Hasil:** Instrumen yang direview dapat dikelompokkan menjadi: penilaian fungsi dan disfungsi penciuman; kualitas hidup terkait penciuman; serta sikap, respons emosional, dan persepsi individu terhadap pentingnya penciuman. Nilai reliabilitas koefisien Cronbach's alpha berkisar 0,6-0,98. Beberapa instrumen yang bersifat komprehensif, seperti Olfactory Disorders Questionnaire (ODQ) dan Taste and Smell Tool for Evaluation (TASTE), memiliki lebih dari 30 item, sehingga memerlukan waktu pengisian yang lebih lama dan berpotensi membatasi penerapannya dalam praktik klinik rutin. Bukti validitas prediktif dalam mengevaluasi efektivitas intervensi klinis masih terbatas. **Kesimpulan:** Berbagai kuesioner penciuman yang telah tervalidasi dengan baik sudah tersedia, dapat melengkapi pemeriksaan objektif fungsi penciuman dalam praktik klinik maupun penelitian.

Kata kunci: pengkajian, penciuman, kuesioner, skala

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INTRODUCTION

The sense of smell is a fundamental component of the human sensory system, contributing to environmental awareness, safety, nutrition, and social interaction.¹ Olfactory function ranges from normosmia to quantitative disorders such as hyposmia (partial loss), and anosmia (complete loss), as well as hyperosmia, which denotes heightened olfactory sensitivity.² Qualitative olfactory dysfunction includes parosmia, characterized by distorted odor perception, and phantosmia, defined as the perception of odors without an external stimulus.³

Olfactory dysfunction arises from diverse etiological factors, including aging, smoking, head trauma, hormonal alterations, medication effects, and medical conditions affecting the upper respiratory tract or central nervous system.⁴ Sinonasal diseases and post-infectious conditions represent the most frequently reported causes, followed by head injury, neurological disorders, and idiopathic origins.⁵

Epidemiological evidence indicates that olfactory dysfunction is common, although prevalence estimates vary according to population and assessment method.⁶ Persistent anosmia affects approximately 1–5% of the general population, while milder impairments such as hyposmia are substantially more prevalent.⁷ Olfactory abnormalities have been reported in up to 20% of children, with prevalence increasing markedly in older adults, particularly beyond the age of 60 years. Overall, olfactory dysfunction is estimated to affect 20–60% of certain populations, underscoring its clinical and public health significance.⁷

Beyond sensory impairment, olfactory dysfunction has profound consequences for quality of life. Reduced or altered olfactory

function is associated with emotional distress, impaired social functioning, diminished enjoyment of food, and compromised safety. Both decreased olfactory performance and heightened sensitivity have been linked to alterations in affective and emotional processing.⁸ Moreover, olfactory dysfunction has gained attention as an early clinical indicator of systemic and neurological disorders, including COVID-19 infection and various neuropsychiatric and neurodegenerative conditions such as depression, schizophrenia, and dementia.⁹

Given its high prevalence and substantial impact, accurate assessment of olfactory function is essential. Olfactory evaluation may be performed using objective tests and subjective approaches. Subjective assessment tools, including questionnaires and self-report scales, provide valuable insight into patient's perceived olfactory function and its impact on daily life. In recent years, several validated questionnaires have been developed to complement objective testing in both clinical and research settings.¹⁰ A systematic synthesis of these instruments is therefore warranted to support comprehensive evaluation of olfactory dysfunction and its consequences.

METHOD

A systematic review was conducted following the PRISMA 2020 guidelines. Articles were identified through three electronic databases: PubMed, ScienceDirect, and ProQuest. The search strategy combined controlled vocabulary and free-text terms using Boolean operators: “olfactory” OR “olfaction” OR “smell” AND “questionnaire” OR “instrument” OR “scale” OR “measure” OR “score”. The search was limited to studies published between 2014 and 2024 and written in English.

The inclusion criteria were full-text original articles or systematic reviews that reported the development, validation, or psychometric evaluation of questionnaire-based instruments assessing olfactory function; and involving human participants. The exclusion criteria were objective olfactory testing only (e.g., odor identification, threshold, or discrimination tests

using actual odorants) without a self-reported questionnaire component; focused solely on animal models; and editorials, conference abstracts, or non-peer-reviewed publications.

The study selection process was depicted in Figure 1, using the preferred reporting item for the systematic review method (PRISMA).

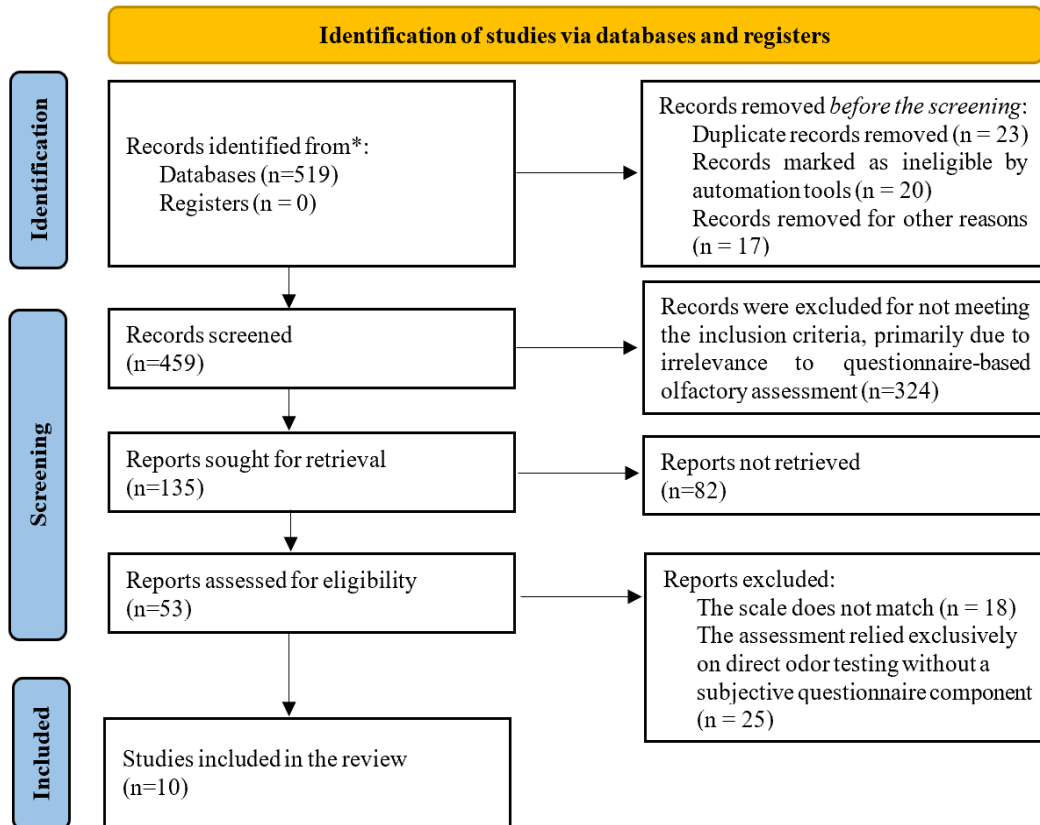


Figure 1. PRISMA flowchart

RESULT

Methodological quality was assessed using the Joanna Briggs Institute (JBI) Critical Appraisal Checklists, applied according to the study design. Six studies employed diagnostic test accuracy designs and were evaluated using the 10-item JBI checklist, while four studies used cross-sectional designs assessed with the 8-item checklist (Table 1).¹¹

Table 1. The results of the study assessment using the JBI critical appraisal checklist

Diagnostic test accuracy research											
Authors	Question item										Overall Appraisal
	1	2	3	4	5	6	7	8	9	10	
Garden et al., 2023	√	√	√	√	√	√	√	√	-	-	Moderate
Konieczny et al., 2024	√	-	-	√	-	√	√	√	√	√	Moderate
Kurt & Kuzgun 2022	√	-	√	√	√	√	√	√	√	√	High
Niklassen et al., 2022	√	-	√	√	-	√	√	√	√	√	Moderate-High
Saatçi et al., 2020	-	√	-	-	√	√	√	√	√	-	Moderate
Zou et al., 2020	-	√	-	-	√	√	√	√	√	-	Moderate

Cross-sectional research											
Authors	Question item								Overall Appraisal		
	1	2	3	4	5	6	7	8			
Takebayashi et al., 2021	-	√	√	√	-	-	√	√	Moderate		
Vernetti et al., 2014	√	√	√	√	√	-	√	√	High		
Burón et al., 2014	√	√	√	√	-	-	√	√	Moderate-High		
McGreevy et al., 2014	√	√	√	√	-	-	√	√	Moderate-High		

√ = criterion met; - = criterion not met or insufficiently reported.

Overall methodological appraisal was determined through domain-based evaluation of key JBI criteria rather than numerical cut-off scores. The methodological quality of the included studies ranged from moderate to high. Most studies clearly described inclusion

criteria, measurement methods, and statistical analyses. However, identification and control of confounding factors were less consistently reported. No study was excluded based on quality appraisal results.

Table 2. Synthesis analysis of olfactory questionnaires

Instrument	Type of validity	Internal consistency	Test-retest	Target population	Key findings
Olfactory Disorders Questionnaire (ODQ)	Construct	$\alpha = 0.54-0.93$	Reported	Chronic rhinosinusitis	Significant correlation with depression and mood indices ($p < 0.05$)
Importance Olfaction Questionnaire (IOQ)	Construct	$\alpha = 0.77$	Not reported	General olfactory impairment	Subjective olfactory perception aligned with clinical evaluation
Taste and Smell Dysfunction Questionnaire (TSDQ)	Content	$\alpha = 0.78-0.97$	Not reported	Hemodialysis patients	High expert agreement (CVI = 0.96)
Taste and Smell Tool Evaluation (TASTE) Questionnaire	Construct	$\alpha = 0.65-0.86$	$r = 0.55-0.86$	Chemosensory dysfunction	Correlation with clinical chemosensory dysfunction

Instrument	Type of validity	Internal consistency	Test-retest	Target population	Key findings
Self-Reported Olfactory Functioning (ASOF)	Known-group	$\alpha = 0.97-0.98$	Not reported	Subjective olfactory dysfunction	Significant discrimination between healthy and impaired subjects
Self-reported Mini Olfactory Questionnaire (Self-MOQ)	Criterion	$\alpha = 0.84$	Not reported	Post-infectious smell loss	Strong correlation with Sniffin' Sticks ($r = -0.597$)
Self-Administered Odor Questionnaire (SAOQ)	Criterion	$\alpha = 0.87-0.95$	Not reported	Olfactory disorders	Correlated with T&T olfactometry ($r = -0.578$)
Hyposmia Rating Scale (HRS)	Criterion	$\alpha = 0.89$	Not reported	Parkinson's disease	Correlation with Sniffin' Sticks ($r = 0.65$)
Relational Scale Olfaction (EROL)	Convergent	$\alpha = 0.76$	$r = 0.748$	Anxiety and depression	Correlation with anxiety and olfaction scales
Taste and Smell Survey (TSS)	Construct	$\alpha = 0.80-0.92$	Not reported	Chemotherapy patients	Moderate-high correlation with objective taste and smell measures

Characteristics of olfactory questionnaires

Table 2 summarized the characteristics of the ten included studies, revealing substantial heterogeneity in questionnaire structure, psychometric properties, and target populations. The number of questionnaire items ranged from 5 to 52, reflecting differences in conceptual focus, from brief screening tools (e.g., Self-MOQ) to multidimensional instruments assessing emotional, functional, and quality-of-life impacts of olfactory dysfunction (e.g., ODQ, TASTE, SAOQ).

Across studies, construct validity was most commonly assessed through correlations with established objective olfactory tests such as Sniffin' Sticks, T&T olfactometry, or clinical diagnostic measures, with correlation coefficients ranging from moderate to strong ($r=0.53-0.81$). Reliability was predominantly evaluated using Cronbach's alpha, which ranged from 0.54 to 0.98, indicating acceptable to excellent internal consistency for most instruments.

Notably, questionnaires developed for specific clinical populations such as patients with chronic rhinosinusitis, Parkinson's disease, or chemotherapy-related sensory dysfunction tended to demonstrate higher domain-specific reliability compared to more general instruments.

Narrative synthesis of findings

A qualitative synthesis of the findings indicated that subjective olfactory questionnaires consistently captured aspects of olfactory dysfunction that were not fully reflected by objective psychophysical tests, particularly emotional impact, perceived functional loss, and quality-of-life impairment. Instruments with multidimensional constructs showed greater sensitivity in distinguishing between healthy controls and individuals with hyposmia or anosmia.

However, cross-study comparison was limited by variations in questionnaire content, validation methods, and population

characteristics. This heterogeneity precluded quantitative meta-analysis, reinforcing the appropriateness of a narrative synthesis approach.

DISCUSSION

This systematic review highlighted that questionnaires for olfactory assessment serve distinct but complementary purposes when compared with objective olfactory tests. While standardized psychophysical tools such as the University of Pennsylvania

Smell Identification Test (UPSIT) and Sniffin' Sticks remained the reference standard for diagnosing olfactory dysfunction, self-reported instruments provide critical insight into the subjective burden, functional consequences, and psychosocial impact of olfactory impairment, which could not be fully captured by objective testing alone.²⁰ Based on their primary constructs, the reviewed instruments could be thematically grouped into three major categories (Table 3).

Table 3. Thematic synthesis of olfactory questionnaires: strengths, limitations, and clinical use

Thematic category	Instrument examples	Key strengths	Main limitations	Recommended clinical / research use
Quality of life oriented olfactory dysfunction	ODQ, Short-ODQ	Comprehensive assessment of emotional, social, and functional impact; good content validity; widely used in clinical populations	Lengthy; higher respondent burden; less feasible for routine screening	Evaluation of impact of olfactory dysfunction on daily life; outcome assessment in interventional and rehabilitation studies
Symptom frequency and screening instruments	TSDQ, Self-MOQ, SAOQ, HRS	Brief and easy to administer; good feasibility; acceptable concurrent validity with objective tests; suitable for longitudinal monitoring	Reliance on self-perception; limited test-retest reliability in some tools; risk of underreporting in unrecognized dysfunction	Screening, follow-up, and rapid clinical assessment; adjunct to objective olfactory tests
Attitudinal and olfactory awareness scales	IOQ, EROL	Capture cognitive, emotional, and behavioral relevance of olfaction; useful for psychosocial profiling; cross-cultural applicability	Influenced by demographic factors; less specific for sensory performance; some items unrelated to perception	Research on olfactory awareness, coping strategies, and psychosocial adaptation; supplementary assessment in clinical populations

Quality of life oriented dysfunction questionnaires

In the first category, the Olfactory Disorders Questionnaire (ODQ) was the most extensively used instrument to assess the impact of olfactory dysfunction on daily life and well-being.^{21,22} Its strength lay in its multidimensional structure, capturing emotional distress, coping strategies, and

social desirability, which makes it particularly useful in clinical populations such as patients with chronic rhinosinusitis or traumatic brain injury. However, its length might limit feasibility in routine clinical settings. The development of a shortened ODQ version had partially addressed this limitation by maintaining clinical utility while reducing respondent burden.²³

Symptom frequency and screening tools

The second thematic group included symptom-oriented and screening instruments such as the Taste and Smell Dysfunction Questionnaire (TSDQ), Self-Reported Mini Olfactory Questionnaire (Self-MOQ), Self-Administered Odor Questionnaire (SAOQ), and Hyposmia Rating Scale (HRS). These tools prioritized feasibility and rapid assessment. The TSDQ demonstrated acceptable reliability across diverse clinical populations, including hemodialysis and oncology patients, and was advantageous for longitudinal monitoring of chemosensory changes.¹² In contrast, the Self-MOQ offered excellent practicality due to its brevity and showed good discriminative validity for normosmia, hyposmia, and anosmia.¹⁵ Nevertheless, the absence of robust test–retest reliability data represented a methodological weakness that limited its interpretability over time. Similarly, SAOQ and HRS demonstrated strong correlations with objective olfactory measures such as Sniffin’ Sticks and T&T thresholds, supporting their concurrent validity.^{16,17} Despite this, these instruments remained vulnerable to subjective misperception, particularly among individuals who were unaware of gradual olfactory decline.

Attitudinal and perceptual awareness scales

The third category comprised instruments assessing olfactory awareness and attitudinal significance, including the Importance of Olfaction Questionnaire (IOQ) and the Relational Scale of Olfaction (EROL). The IOQ uniquely captured cognitive, emotional, and behavioral dimensions of olfaction and had demonstrated cross-cultural applicability.²⁴ Its ability to identify maladaptive or adaptive coping responses in individuals with olfactory loss represented a notable advantage. However, IOQ scores were strongly influenced by demographic variables such as gender, age, and education,

which might confound clinical interpretation. EROL, while demonstrating acceptable psychometric properties, incorporates items not directly related to olfactory perception, thereby limiting its specificity for clinical olfactory assessment.¹⁸

Comparative strengths and limitations across instruments

Across instruments, a clear trade-off emerges between depth and feasibility. Comprehensive tools such as ODQ provide rich clinical information but are less practical in high-volume settings, whereas brief screening tools enhance usability but may sacrifice sensitivity to nuanced functional impairments. Importantly, no single questionnaire adequately replaces objective olfactory testing; rather, questionnaires function optimally as adjuncts that contextualize psychophysical findings within patient’s lived experiences.

Quality of evidence and risk of bias

The overall quality of evidence supporting these instruments is moderate. Most validation studies employed cross-sectional designs with convenience samples, which increases the risk of selection bias. Additionally, self-reported questionnaires are inherently susceptible to recall bias and social desirability bias, particularly in instruments addressing quality of life and emotional impact.²⁵ Gender-related differences in olfactory perception, consistently reported across studies, might reflect true biological variation but might also indicate response bias, as women tend to report sensory experiences more readily than men.²⁶ Furthermore, limited reporting of test–retest reliability and inter-rater agreement in several studies weakened the robustness of longitudinal interpretations.

Clinical and research implications

Despite these limitations, olfactory questionnaires remain indispensable in both

clinical practice and research. They enable systematic assessment with minimal time and resource demands and are particularly valuable for screening, monitoring treatment outcomes, and evaluating patient-reported impact. However, the findings of this review reinforced that subjective assessments should not be used in isolation. Optimal evaluation of olfactory function requires integration of questionnaire-based data with objective olfactory tests, to ensure accurate diagnosis and comprehensive patient-centered care.

In conclusion, this systematic review indicated that the selection of olfactory questionnaires should be driven by assessment purpose rather than the assumption of a single superior instrument.

Comprehensive tools such as the ODQ and the TASTE demonstrated the strongest psychometric robustness and multidimensional validity, supporting their use in research settings and detailed clinical evaluation, particularly for quality-of-life outcomes. In contrast, shorter instruments including the Self-MOQ, TSDQ, and HRS provided greater clinical feasibility and were well suited for rapid screening and routine follow-up. Attitudinal scales such as the IOQ and EROL contributed valuable psychosocial insights but lack specificity for sensory performance and should be applied as adjunctive measures. Overall, subjective questionnaires were most effective when integrated with objective olfactory testing, to enable comprehensive and patient-centered assessment.

The main limitations of this review included methodological heterogeneity, reliance on cross-sectional validation studies, limited test–retest evidence, and the absence of PROSPERO registration. Future studies should focus on longitudinal validation and direct comparisons between instruments to strengthen clinical guidance.

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