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Literature Review of Questionnaires Assessing Vertigo and Dizziness, and Their Impact on Patients' Quality of Life

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ABSTRACT

Objectives: Vertigo and dizziness, which are major symptoms of diseases affecting the vestibular system, drastically impair patients' health-related quality of life (QoL). Patient's perspectives are thus essential to symptom assessment. We sought to make a critical review of published questionnaires measuring vertigo or dizziness, and/or their impact on QoL.
Methods: Twenty-nine articles reporting the validation or use in clinical trials of vertigo- or dizziness-specific questionnaires were identified over the 1991–2004 period, and reviewed using a methodological and a Patient-Reported Outcomes specific checklist. Questionnaires were classified into three categories according to content: QoL (or handicap), mixed (assessing both symptoms and QoL), and symptom questionnaires.
Results: Four QoL, three mixed questionnaires, two symptoms, and one Meniere's disease-specific questionnaire were identified. QoL questionnaire validation was usually not complete. The structural validity of the Dizziness Handicap Inventory is not established, although this questionnaire is considered to be the reference questionnaire in the QoL domain. Moreover, QoL questionnaires were not very specific to vertigo or dizziness. Similarly, the Vertigo Handicap Questionnaire appeared to have the most pertinent content, but its validation remains to be completed. Mixed questionnaires have the same imperfections. The Vertigo, Dizziness, Imbalance (VDI) Questionnaire had the best validation score from the checklist, but its responsiveness appears to be weak. Regarding symptom questionnaires, the European Evaluation of Vertigo questionnaire evaluated the five major symptoms of vestibular syndrome satisfactorily.
Conclusion: The present literature review failed to find any relevant and validated questionnaire assessing the impact of vertigo or dizziness on QoL.
Keywords: dizziness, patient-reported outcomes, quality of life, vertigo.

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Introduction

Vertigo and dizziness are major symptoms of diseases affecting the vestibular system. They can be induced by either chronic or transitory disorders, with unpredictable recurrence, making their clinical features variable. Benign paroxystic vertigo (i.e., short acute episodes in a context of normal functioning) is the most frequent form. On the other hand, vestibular neuritis, Meniere's disease, and other forms of recurrent vertigo are characterized by longer duration of symptoms (i.e., vertigo followed by dizziness) with frequent, unpredictable recurrence of variable intensity.

The subjective perception of vertigo and dizziness is influenced by the patient's personality, anxiety with regard to unforeseeable recurrence, associated symptoms (neurovegetative, hearing disorder, etc.), and the unpredictable evolution of the underlying disease. Subjective perception is thus only poorly correlated with objective assessment, by vestibular testing for example [1–3]. Agreement between patient's and physician's

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symptom assessment has been reported to be moderate for vertigo and other symptoms [4,5]. Because vertigo and dizziness impair daily life, even during asymptomatic periods, mere symptom assessment is not sufficient: the patient may in fact be more worried by the anticipation of the next unpredictable episode of vertigo or dizziness than by the symptom itself [1,2]. This is also true for other conditions such as irritable bowel syndrome or migraine [6,7].

In this context, the patient's perspective appears to be essential if all the aspects of vertigo and dizziness are to be taken into account; hence, it would be useful to have a relevant and valid questionnaire, filled in by the patient, which could be used both in everyday practice and for therapeutic strategy assessment. The present study sought to inventory and describe published questionnaires measuring vertigo and dizziness and/or their impact on health-related quality of life (QoL) and to make recommendations as to their use.

Methods

Articles published in English or French were inventoried over the 1991–2000 period in the MEDLINE and EMBASE databases, using the following key words: "dizziness, vertigo, vestibular disorders, balance disorders" and "scale, instrument, questionnaire, index, quality of life, health status, well-being." Of the 39 articles identified by this literature review, 29 were selected by the organizing committee (Olivier Chassany, Isabelle Mosnier, Didier Bouccara, Olivier Sterkers) as reporting validation of vertigo- or dizziness-specific questionnaires or their use in clinical trials.

Each of these 29 articles was reviewed by the organizing committee and by two or three members of the working group. The working group (18 members) was multidisciplinary, mainly comprising ear, nose, and throat (ENT) specialists, but also physical therapist, neurologists, pain specialists, and general practitioner. Articles were reviewed using the ANAES (Agence Nationale d'Accréditation et d'Evaluation en Santé) general methodological checklist (http://www.anaes.fr). Questionnaires were then classified according to content, in three categories: symptom, QoL (or handicap), and mixed questionnaires (assessing both symptoms, and QoL or handicap). The face validity (i.e., relevance of each item to vertigo and/or dizziness) was considered for each questionnaire. The working group was also asked to check whether the validation study population was representative of the population of patients suffering from vertigo or dizziness.

Each questionnaire validation report was reviewed by one member of the organizing committee (Olivier Chassany), using a Patient-Reported Outcomes (PRO)-specific checklist derived from the European Regulatory Issues on Quality of Life Assessment Working Group (ERIQA) [8]. This checklist (Table 1) has already been used in other reviews (i.e., asthma, chronic obstructive pulmonary disease or irritable bowel syndrome) [9,10]. It is based on 15 criteria, each scored between 0 and 4, giving a total score of between 0 (poor validation) and 100 (good validation) after transformation.

Table 1 Checklist used to assess the validity of the questionnaires

1. Item generation and conceptual model underlying the development of the questionnaire. Level of patients' input
2. Description and adequacy of the population involved in the different steps of validation
3. Size of the population involved in the different steps of validation
4. Description of the questionnaire (number of items and dimensions)
5. Scaling (response options) and scoring
6. Period recall (period to which the answers must relate)
7. Item reduction process (may involve distribution of response options, content validity, expert opinion, and psychometric analyses: i.e., factor analysis)
8. Internal consistency (level of correlation of the items in a dimension)*
9. Test–retest (stability of scores over time when patient's condition is considered stable)*
10. Content validity (items and response options are relevant and comprehensive of the dimensions)
11. Structural validity (factor analysis or similar to support the hypothesized scale structure: i.e., the combination of items into dimensions)†
12. Discriminant validity (capacity of the questionnaire to discriminate the patients according to certain characteristics, e.g., severity of the disease)†
13. Convergent validity (correlations of the questionnaire with a scale known as of reference or which is supposed to measure more or less similar concepts)†
14. Predictive validity (future evolution of the disease can be predicted by score changes of the questionnaire)†
15. Responsiveness (ability to detect changes)

*Internal consistency and test–retest measure questionnaire reliability.
†Structural, discriminant, and convergent validity are part of the construct validity, which assesses the conformity with the conceptual model of the relationship between items and dimensions.
Scores for each item ranged between 0 (bad) and 4 (good). A total score was then computed to obtain a range from 0 (bad) to 100 (good).

At the end of this systematic appraisal, a further literature search was conducted over the 2001–2004 period. But no publication relating to validation of any new specific questionnaire for vertigo and/or dizziness was identified.

Results

Table 2 presents the 10 questionnaires identified in the 29 articles: four QoL or handicap [1,11–25], three mixed [5,26,27], and two symptomatic [2,28–33] questionnaires were identified plus one Meniere's disease-specific questionnaire [34,35]. Validation scores obtained from the PRO-specific checklist (Table 1) ranged between 36 and 77 (Fig. 1). An additional Meniere's disease-specific questionnaire, from the American Academy of Otolaryngology—Head and Neck Surgery (AAO-HNS), was identified, but was not assessed, because validation data were not available

Table 2 Names of the 10 vertigo- and dizziness-specific questionnaires identified and selected from the literature review (1991–2000)

Classification	Abbreviation	Name	References
Handicap or quality of life	DHI	Dizziness Handicap Inventory	[1,11–20]
	VADL	Vestibular Disorders of Daily Living Scale	[21,22]
	ABC	Activities-specific Balance Confidence	[23,24]
	VHQ	Vertigo Handicap Questionnaire	[25]
Mixed	VDI	Vertigo, Dizziness, Imbalance Questionnaire	[26]
	UCLA-DQ	UCLA Dizziness Questionnaire	[5]
	DFI	Dizzy Factor Inventory	[27]
Symptomatic	VSS	Vertigo Symptom Scale	[2,28–32]
	EEV	European Evaluation of Vertigo	[33]
Meniere's disease	MD-POSI	Meniere's Disease Patients-Oriented Severity Index	[34,35]

Mixed questionnaires assess both symptoms and their impact on quality of life. An additional Meniere's disease-specific questionnaire, the American Academy of Otolaryngology—Head and Neck Surgery (AAO-HNS) was identified, but not assessed, as validation data were not available [36].

[36]. A description and critique of each identified measure is provided below.

Quality of Life or Handicap Questionnaires (Table 3)

The Dizziness Handicap Inventory (DHI) is a 25-item measure that evaluates the self-perceived deleterious effect of vestibular syndrome in the patient's daily life [1]. Content analysis grouped the 25 items into three dimensions: functional, emotional, and physical aspects of dizziness and unsteadiness. Discriminant validity was demonstrated by the good relationships between number of dizziness episodes (i.e., <12, ≥12, permanent dizziness) and DHI scores. Convergent validity, studied in 67 patients identified on an ENT specialist outpatient waiting list, was demonstrated by the high correlation coefficients between the total DHI score and the eight dimensions of the generic questionnaire SF-36 [11].

The DHI from its frequent use could be regarded as a reference questionnaire, because the questionnaire

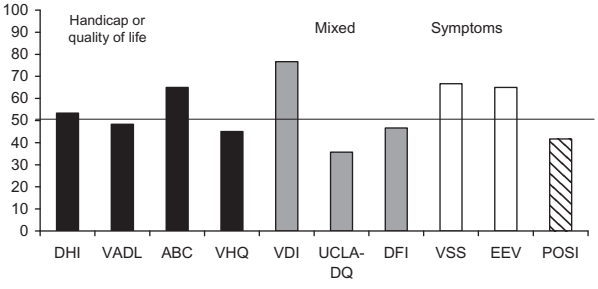

Figure 1 Quality of validation score for each of the questionnaires assessing vertigo or dizziness, and/or its disabling consequences on quality of life. Mixed questionnaires assess both symptoms and their impact on quality of life. Scores assessed the quality of the validation of the questionnaires according to the 15 criteria listed in Table 1. They ranged between 0 (poor validation) and 100 (good validation). ABC, Activities-specific Balance Confidence; DFI, Dizzy Factor Inventory; DHI, Dizziness Handicap Inventory; EEV, European Evaluation of Vertigo; POSI, Patients-Oriented Severity Index; UCLA-DQ, UCLA Dizziness Questionnaire; VADL, Vestibular Disorders of Daily Living Scale; VDI, Vertigo, Dizziness, Imbalance Questionnaire; VHQ, Vertigo Handicap Questionnaire; VSS, Vertigo Symptom Scale.

items seem relevant to the context of the symptoms. Nevertheless, the patients who have taken part in the various validation studies are not fully representative of the population with dizziness, because many patients had a chronic pathology evolving for several years. The construct validity of the DHI is questionable, because only item–total correlation has been studied. A factor (or similar) analysis would have been necessary to check the hypothesized scale structure by demonstrating that correlations between items from a given dimension are stronger than with items from other dimensions. Moreover, two studies call into question the structure of the DHI [13,14]. A factor analysis, involving 95 patients referred to a tertiary-care vestibular disorders clinic, yielded three factors comprising items different from those recommended by Jacobson et al: "disability in activities of daily living," "phobic avoidance," and "postural difficulties" [13]. Similarly, Perez et al. in a factor analysis on data from 337 Spanish patients [14], found three factors, different from those in the original publication: "vestibular disability," "vestibular handicap," and "visio-vestibular disability." Slight changes in questionnaire structure are usual when questionnaires are adapted to other countries; but one needs to be sure that a forward–backward translation procedure is used in producing other language versions of the DHI to ensure that the concepts of the original English version are conserved. These methodological issues in the DHI are significant, casting doubt on the validity of the measure.

Lastly, the responsiveness of the DHI has been studied on a very limited number of patients, or retrospectively, preventing any definitive conclusions [1,15–18]. Two different short versions of the DHI have also been published [19,20]. It remains unclear whether these short versions are sufficiently responsive to be used as assessment tools.

The Vestibular Disorders Activities of Daily Living (VADL) scale assesses the impact of vestibular impairment on everyday activities. The 28 items are grouped into three dimensions: functional (self-care and

Table 3 Principal elements of validation of handicap or quality of life questionnaires

Questionnaire	DHI	VADL	ABC	VHQ
Author (year)	Jacobson (1990) [1]	Cohen (2000) [21]	Powell (1995) [23]	Yardley (1992) [25]
Items/dimensions	25/3	28/3	16/1	22/4
Item generation	HHI for the elderly [3] and patients' interview (n = 63; 49 ± 19 years; women: 60%). Patients from an audiology department	ADL questionnaire [45] and patients' interviews (n = 34) and occupational and physical therapists' interviews [46]	FES [37] and patients' (n = 13, >65 years) and clinicians' (n = 15) interviews. Patients undergoing a physiotherapy	Patients' interview
Included population (validation studies)	106 patients referred for vestibular tests (48 ± 16 years, women: 62%). Three groups of patients: <12 episodes within the previous year (n = 39); ≥12 episodes (n = 51); or permanent (n = 16)	93 patients referred for vestibular rehabilitation after diagnosis of peripheral vestibular disorder: (a) with CV > 3 months (n = 66, 55 ± 17 years; women: 68%); (b) with posterior canal BPPV (n = 27; 52 ± 12 years; 74%) 28 patients with unilateral BPPV (content analysis of the final version)	60 subjects (age: 65–95 years, men: 72%). The mobility (high or low) of the subjects was evaluated according to the need for assistance in walking or not	84 patients (16–78 years; women: 64%) referred for a vertigo evolving for 6 months to 5 years to an audiology department
Dimensions (items for ABC)	Functional: 9 items Emotional: 9 items Physical: 7 items	Functional: self-care and intimate activities (12 items). Ambulation: walking and stair climbing (9 items). Instrumental: home management, productivity, and leisure activities (7 items)	Most important activities essential to independent living that while requiring some position change or walking, would be safe and nonhazardous to most elderly persons	Handicap of restriction of activity. Social anxieties. Fears about vertigo. Severity of vertigo attacks
Items scaling	Yes/sometimes/no scored 0/2/4, respectively	10-point Likert verbal scale: from 1 (independent) to 10 (too difficult, no longer perform)	0–100 response continuum	5-point Likert verbal scale, from 0 (no handicap) to 4 (maximum handicap)
Scores	Total score: 0 (no handicap) and 100 (significant handicap) Functional scale: 0–36 Emotional scale: 0–36 Physical scale: 0–28	1–10	0 (no confidence) to 100 (complete confidence in performing the task without losing balance or becoming unsteady)	0–100
Internal consistency: Cronbach α coefficient	Total score: 0.89 Functional: 0.85 Emotional: 0.72 Physical: 0.78	Total score: 0.97; 3 Dimensions: from 0.91 to 0.96	0.96	Total score: 0.93; Dimensions: 0.75–0.82
Reproducibility (test–retest): *r* = intraclass coefficient (except VHQ)	14 patients (same day) Total score: 0.97 Functional: 0.94 Emotional: 0.97 Physical: 0.92	17 patients (2-h interval). Total score: 1 3 dimensions: 0.87–0.97	21 patients (2-week interval) 0.92	13 patients (6-month interval). No significant change (test *t*, $P > 0.05$)
Structural validity	Item–total correlation study*†	Item–total correlation study*	Analysis close to that of the item- total correlation*	Factor analysis yielded 4 factors (dimensions)
Discriminant validity	Discrimination of the patients according to the number of episodes of vertigo	Significant difference between control and patients ($P < 0.0001$). No difference between patients with BPPV and CV. No correlation between VADL scores and vertigo intensity (10-point scale). Moderate correlation between VADL scores and vertigo frequency (10-point scale): from $r = 0.32$ ($P = 0.04$) to 0.42 ($P = 0.004$) (Spearman)	ABC scores lower in patients fallen the previous year than not fallen ($P = 0.058$). ABC scores lower in patients with than without reduced mobility: 38.3 vs. 80.9 ($P < 0.001$)	VHQ score impaired when the rotatory vertigo is recurrent instead of being single ($P < 0.03$)
Convergent validity	DHI vs. SF-36: *r* from 0.53 to 0.72 according to dimensions (Spearman)	VADL vs. DHI: $r = 0.66$, $P < 0.001$ (Spearman)	ABC vs. DHI: $r = -0.64$, $P < 0.0005$; ABC vs. FES: $r = 0.84$, $P < 0.001$	Not evaluated
Responsiveness	Several retrospective studies and/or with a weak number of subjects. Score values not presented	Not evaluated	Not evaluated	VHQ score decreased (test *t*, $P = 0.04$) among 14 patients who improved after 6 months
Total number of patients	769	252	131	84

*Study of the correlations of the items compared with the whole questionnaire; †Two subsequent and independent studies questioned the structure of the questionnaire, using factor analysis [13,14].

ABC, Activities-specific Balance Confidence questionnaire; ADL, Activities of Daily Living; BPPV, benign paroxysmal positional vertigo; CV, chronic vertigo; DHI, Dizziness Handicap Inventory; FES, Falls Efficacy Scale; HHI, Hearing Handicap Inventory; SF-36, generic quality of life questionnaire; VADL, Vestibular Disorders of Daily Living Scale; VHQ, Vertigo Handicap Questionnaire.

intimate activities), ambulation (walking and stair climbing), and instrumental (home management and leisure activities) [21]. The population included in the validation study consisted of 93 patients referred for vestibular rehabilitation after a diagnosis of peripheral vestibular disorder had been made by an otolaryngologist or neurologist [21,22].

The content and wording of items on the VADL do not seem very specific to vertigo. Reproducibility has also not been measured adequately. The construct validity of the VADL has not been verified using factor analysis, but only by item–total correlations, and correlations of items within their dimensions. Convergent validity has been demonstrated by the high correlation between the total VADL and total DHI scores [22]. There is some evidence of discriminant validity, because VADL scores have been shown to distinguish patients from controls ($P < 0.0001$) [22], Nevertheless, the VADL did not discriminate patients with benign paroxysmal positional vertigo (BPPV) from patients with chronic vestibulopathy. Likewise, there was no significant correlation between VADL total score and the intensity of vertigo. There was only a moderate correlation between frequency of vertigo, and total VADL score and the "instrumental" dimension score [22]. Thus, interpretation is far from straightforward, because the discriminant capacity of the VADL with respect to other clinical measures of vertigo is moderate or nonexistent. A new questionnaire should show a minimum of discriminant capacity according, for example, to the severity of the disease. It is possible that the VADL's lack of discriminant capacity is related to the absence of impairment in the validation study population: mean score around 1 on a scale from 1 (good) to 10 (bad).

The 16-item Activities-specific Balance Confidence (ABC) scale was developed to provide a more precise description of elderly people's everyday difficulties and fear of falling [23]. An analysis close to that performed in item–total correlation studies was made to measure the link between each item and the scale as a whole. The ABC score was able to discriminate patients with and without a fall within the previous year ($P = 0.058$). Likewise, the ABC score was lower in patients with reduced mobility than without reduced mobility ($P < 0.001$). A high correlation was found between ABC and DHI scores in a study performed on 71 patients over 65 years of age [24].

The content and wording of the ABC questionnaire is not specific to vertigo. It focuses on elderly subjects' mobility. The strong correlation between the ABC and the Falls Efficacy Scale [37], from which the former was generated, raises the question as to whether the ABC provides any new or better information [23]. At all events, it is unsuited for the study of vertigo and balance disorders.

The Vertigo Handicap Questionnaire (VHQ) includes 22 items reflecting the disabling consequences of vertigo, including limitations of vertigo on physical and everyday activities to its impacts on social life and leisure [25]. Factor analysis yielded four factors, explaining 63% of the variance. Item reduction, mainly based on the level of correlation of the items with the dimensions, reduced the number of items from 46 to 22. Discriminant validity was assessed using patients with episodic rotatory vertigo and patients only having experienced a single episode. Scores were worse in case of episodic vertigo ($P < 0.03$). The responsiveness of the VHQ has been studied only on a very limited number of patients [25].

In general, the VHQ appears to be one of the most relevant and promising questionnaires for assessing the impact of vertigo on QoL. Its psychometric properties, however, need to be confirmed with larger numbers of patients [25,28].

Mixed Questionnaires (Table 4)

The 36-item Vertigo, Dizziness, Imbalance (VDI) questionnaire measures feelings of dizziness and unsteadiness and their psychosocial consequences [26]. Item reduction, based on content analysis and factor analysis, reduced 175 initial items to 36. Items were empirically grouped into two dimensions—symptoms (VDI symptoms) and QoL (VDI HRQoL)—on the basis of content analysis. A factor analysis, however, was not performed on all items but on these two empirical dimensions, raising some doubt as to the construct validity of the subscales. Scores on the two VDI dimensions evolved similarly to a balance scale (functional capacity to maintain balance while performing 14 movements required in everyday living) [38] and perceived symptom severity scores ($P < 0.001$). Convergent validity was demonstrated as the VDI Symptoms dimension correlated with the balance scale and the Physical Component Summary of the SF-12 (short version of the generic SF-36 questionnaire). Correlations with the Mental Component Summary of the SF-12 were lower. On the other hand, the VDI HRQoL dimension yielded strong correlations with all these questionnaires.

Responsiveness has been studied, but changes appear to be modest. Fifty patients, whose symptoms improved after a mean 19 days' follow-up, also showed improved in their VDI scores [26], but only slightly: effect size 0.3 (VDI symptoms) and 0.2 (VDI HRQoL), whereas an effect size of 0.5 or more is generally required for a change to be considered minimally important [39].

The UCLA Dizziness Questionnaire (UCLA-DQ) contains five items assessing the frequency and severity of dizziness, the impact on everyday activity, QoL, and fear of dizziness [5]. The level of correlation between the five items of the UCLA-DQ was not presented in

Table 4 Principal elements of validation of mixed questionnaires

Questionnaire	VDI	UCLA -DQ	DFI
Author	Prieto (1999) [26]	Honrubia (1996) [5]	Hazlett (1996) [27]
Items/dimensions	36/2	5/5	44/3
Item generation	VSS, VHQ, and DHI questionnaires and patients (n = 25) and clinicians' interviews (n = 8; 2/ country: France, Germany, Spain, and UK)	Clinicians' and patients' interview. Patients suffering from a vestibular dysfunction	DHI and MPI questionnaires
Included population (validation studies)	130 Spanish patients (67 ± 9 years, women: 69%) recruited by GPs (32%), neurologists (32%), and ENT specialists (36%). Diagnosis known for 56 patients: peripheral vertigo (56%), central vertigo (21%), other (23%)	343 patients (18–93 years, women: 58%). Major diagnoses: migraine (n = 98), benign positional vertigo (n = 83), central diseases (n = 53), Meniere's disease (n = 47), psychogenic disorders (n = 35), peripheral disorders (n = 27)	184 patients (52 ± 16 years, women: 64%) referred to a dizziness and balance center. Duration of vertigo: 4.5 ± 7.5 years
Dimensions (items for UCLA-DQ)	VDI symptoms: feelings of dizziness and unsteadiness common associated symptoms (14 items) VDI QoL: psychosocial consequences of vertigo, dizziness or imbalance (22 items)	Frequency Severity Impact on daily activities Impact on QoL Fear of becoming dizzy	Symptom factors (22 items) Obvious responses of significant others to the dizzy (11 items) Activity level (11 items)
Items scaling	6-point Likert verbal scale: from 1 (all the time) to 6 (never)	5-point Likert verbal scale	5-point Likert verbal scale
Scores	VDI symptoms: from 0 (absence) to 100 (maximal); VDI HRQoL: 0 (worst) to 100 (best)	1 (best) to 5 (worst)	1 (best) to 5 (worst)
Internal consistency: Cronbach á coefficient	VDI symptoms: 0.86 VDI HRQoL: 0.92		From 0.58 to 0.89 according to dimensions
Reproducibility (test–retest): *r* = intraclass coefficient	50 patients at a 19(±6)-day interval VDI symptoms: 0.81 VDI HRQoL: 0.87	Not evaluated	Not evaluated
Structural validity	Factor analysis not performed on items but on the two VDI dimensions, which were projected on 2 factors defined a priori: physical and psychosocial. The VDI symptoms projects itself on the physical factor. The VDI HRQoL projects itself on the 2 factors	Not evaluated	Factor analysis performed separately on each of the 3 dimensions, and not on all the items
Discriminant validity	The two scores of the VDI worsen in parallel with the balance scale score The VDI scores worsen with the perceived severity of the symptoms (ranging score from 0 to 10; $P < 0.001$)	Significant ($P < 0.01$) impact of the frequency and the severity of the dizziness on the 3 others items of the questionnaire (daily activities, QoL, and fear of dizziness). The impact of the frequency dizziness on the QoL and fear is significantly different according to the following pathologies: BPPV, peripheral disorders, and migraine. The most negative impact on the QoL is observed in the "psychogenic" group, the weakest in the patients with benign paroxysmal positional vertigo	Not evaluated
Convergent validity	VDI symptoms is correlated with balance scale ($r = -0.57$) and PCS ($r = -0.5$). Correlation values are low with MCS ($r = -0.3$) and GHQ ($r = 0.17$) VDI HRQoL is correlated with all the questionnaires: balance scale ($r = 0.61$), PCS ($r = 0.57$), MCS ($r = 0.61$) and GHQ ($r = -0.43$)	Not evaluated	Not evaluated
Responsiveness	During a follow-up, 50 patients felt improved and 12 worsened using symptom severity scale. The corresponding change* for these patients is 0.2 for VDI HRQoL and ranged between 0.3 and 0.5 for VDI symptoms	Not evaluated	Not evaluated
Total number of patients	155	680	184

*Effect size: ratio of mean change/standard deviation of this change.
Mixed questionnaires assess both symptoms and their impact on quality of life.
BPPV, benign paroxysmal positional vertigo; DFI, Dizzy Factor Inventory; DHI, Dizziness Handicap Inventory; ENT, ear, nose, and throat; GHQ, General Health Questionnaire (questionnaire of mental health); HRQoL, health-related quality of life; MCS, Mental Component Summary of the SF-12 generic questionnaire; MPI, Multidimensional Pain Inventory; PCS, Physical Component Summary of the SF-12; UCLA-DQ, UCLA Dizziness Questionnaire; VDI, Vertigo, Dizziness, Imbalance Questionnaire; VHQ, Vertigo Handicap Questionnaire; VSS, Vertigo Symptom Scale.

the initial publication. Nevertheless, Perez et al. in a factor analysis on data from 337 Spanish patients presenting with dizziness in an ENT department [14], produced two factors: one correlated with items on frequency, fear of dizziness, and QoL, and the other with items on daily severity and everyday activity. The relationship between frequency and severity of dizziness and the other three items of the questionnaire (everyday activity, QoL, and fear of dizziness) was significant ($P < 0.01$). The impact of frequency of dizziness on the QoL and fear of dizziness scores varied significantly with diagnosis: the greatest impairment was observed in psychogenic disorders, and the weakest in benign positional vertigo. Reproducibility, convergent validity, and responsiveness were not tested.

The Dizzy Factor Inventory (DFI) groups 44 items into three dimensions: symptom factors, patient's perception of other significant responses, and activity level [27]. The initial 88 items were reduced according to content and factor analyses. Items with a large number of missing data, and redundant items were eliminated, and those with the best psychometric profile (e.g., low skewness, high variance, and midrange mean) were retained. The internal consistency of several subscales was lower than the recommended value of 0.7, probably resulting from the small number of items constituting these subscales. Factor analysis was not performed on all items but on each of the three empirical dimensions, raising some doubt on the dimension structure of the items. Test–retest reproducibility, discriminant and convergent validity, and responsiveness were not tested. In general, the DFI questionnaire appears to be pertinent, but its validation needs checking.

Symptomatic Questionnaires (Table 5)

The Vertigo Symptom Scale (VSS) quantifies the number and frequency of long- and short-term vertigo symptoms, autonomic sensations and anxiety arousal, and somatization [2]. The initial version included 36 items. Factor analysis yielded a four-factor structure with 27 items. Some scales discriminated patients according to the cause of vertigo. Patients with spontaneous episodic vertigo had significantly higher scores on the acute attack of vertigo (VACU) dimension, indicating greater impairment, than did patients with nonrotatory vertigo ($P = 0.0007$). Convergent validity was verified by the correlation between the somatization (SOM) and autonomic symptom (AU) dimensions of the VSS, and the anxiety scale of the Hospital Anxiety and Depression (HAD). No significant correlation was observed between the VACU and Vertigo of Short Duration dimensions, and the HAD anxiety scale. The SOM dimension also correlated with the HAD depression scale, whereas the AU dimension did not. All subscales of the VSS correlated moderately with the VHQ [2,29]. The VSS is the only questionnaire for which predictive validity has been reported. A study of 101 patients found that high AU and SOM scores at baseline were predictive of increased handicap (VHQ) 7 months later [30]. Responsiveness data are limited [28,32].

A Spanish version of the VSS has been reported [31]. A factor analysis involving 172 Mexican patients, after translation of the VSS questionnaire into Spanish, yielded a structure similar to that of the English version, thus reinforcing the robustness of the construct validity of the VSS [31]. Similarly, the data supported the convergent validity and the internal consistency of the Spanish VSS [31].

The European Evaluation of Vertigo (EEV) assesses the five major symptoms of vestibular syndrome: illusion of movement, duration of illusion, motion intolerance, neurovegetative signs, and instability [33]. This is also the only scale presented in this review that is based on both patient and physician ratings. In the original validation study, the EEV items correlated to various degrees with vertigo intensity, number of attacks, and vertigo duration. The strongest correlations were observed for the number of attacks and four of the five EEV items (neurovegetative signs excluded) [33]. The correlations were usually strongest after 4 weeks of follow-up, rather than at baseline, possibly because the scores improved over time. EEV was compared with the AAO-HNS questionnaire, which assesses the functional repercussions of vertigo on a scale from 0 to 6 [36]. At the beginning of the study, correlations between the AAO-HNS on the one hand and illusion duration ($r = 0.21$), neurovegetative signs ($r = 0.35$), and instability ($r = 0.23$) scores on the other were moderate. Four weeks later, the coefficients were greater. Correlations between the EEV items and the eight dimensions of the generic SF-36 questionnaire were also assessed. Correlations were weak at baseline, but better for the physical than for the mental SF-36 dimension. Four weeks later, correlations, although stronger than at the beginning of the study, remained moderate. The EEV scale also appeared to be responsive. For the 90 patients showing improvement on the AAO-HNS scale at the 4th week of study, all the EEV scores likewise improved, with effect sizes ranging from 0.99 to 1.5 for the five items, and a effect size of 1.75 for the total score [33]. In comparison, in the same patients, the effect size of the dimension scores of the generic SF-36 questionnaire ranged between 0.15 and 0.60 [33]. This larger magnitude of change in EEV scores is rather logical, as the questionnaire measures precise symptoms—as is the smaller effect size in the case of QoL questionnaires, which capture broader concepts.

The test–retest reproducibility of the EEV has been found to be good, except for the item concerning

Table 5 Principal elements of validation of symptom questionnaires and of a specific Meniere's disease questionnaire

Questionnaire	VSS	EEV	MD-POSI
Author	Yardley (1992) [2]	Mégnibêto (2001) [33]	Murphy (1999) [34]
Items/dimensions	27/4	5/5	16/4 + 4 single items:
Item generation	Literature and patients' interviews	Cardinal symptoms of vertigo	Literature and patients' interviews
Included population (validation studies)	127 patients (18–80 years; women: 61%) attending a neuro-otology outpatient clinic [2]. 72% of patients symptomatic >1 year. Major diagnoses: spontaneous episodic vertigo without (n = 28) or with hearing loss and/or tinnitus (n = 33), nonrotatory vertigo (n = 28), positional vertigo (n = 23), single acute episode of vertigo (n = 12)	123 patients (53 ± 3 years; women: 74%) with vertigo, and recruited by ENT specialists. Patients followed during a 4-week period in an open label study. Length of vertigo >12 months in 50% of patients. Major diagnoses: BPPV (n = 37), MD (n = 34), recurrent vertigo (n = 28), vestibular neuritis (n = 11)	85 patients (28–87 years)
Dimensions (items for EEV)	• Acute attack of vertigo scale (VACU) • Vertigo of short duration (VSH) • Somatization scale (SOM) • Autonomic symptom scale (AU)	Illusion of movement Duration of illusion Motion intolerance Neurovegetative symptoms Instability	During: effects during an attack. Between: effects between an attack. Daily: effect of MD on daily living activities. Job: effect of MD on the patient's occupation + 4 single items: Overall, my Meniere's disease is . . . ; my Meniere's disease has changed my life . . . ; my health is . . . ; & I expect my health in 5 years to be . . .
Items scaling	6-point Likert verbal scale: from 0 (never) to 5 (very often, more than once a week)	The score of each item is the average over the last 8 days	5-point scale (0–4) 6-point scale (0–5)
Scores	0–5	Total score: 0–20. The higher the score, the more severe the symptomatology	0 (none) to 5 (worse ever)
Internal consistency: Cronbach α coefficient	0.69–0.83 according to dimensions		Total questionnaire: 0.92
Reproducibility (test–retest): r = intraclass coefficient (except EEV)	44 patients at a 24-h interval 0.89–0.98	45 patients with a 7-day interval 4 of the 5 items and the total score are not significantly modified (Wilcoxon) Score of "neurovegetative symptoms" item was improved ($P = 0.027$)	Not evaluated
Structural validity	Factor analysis	Not evaluated	Item–total correlation study*
Discriminant validity	Some dimensions discriminate the patients according to their pathology (recurrent vertigo vs. patients with instability)	Highest correlation (from 0.4 to 0.9) between EEV items (except neurovegetative symptoms) and the mean number of attacks, mainly at the 4th week of follow-up	The global composite score (ranging from 0 to 5) increases with the answer to the question "overall, my MD has changed to my life " ($r = 0.49$, $P < 0.0001$): from 0.43 ± 0.72 in case of answer "little if any" to 3.02 ± 1.20 in case of answer "extremely"
Convergent validity	Correlation of AU and SOM scales with HAD anxiety scale: r 0.43 and 0.46, No correlation of VACU and VSH scales with HAD anxiety scale: $r = 0.06$ and 0.01. Correlation of HAD depression scale with SOM scale ($r = 0.41$), but not with AU scale ($r = 0.19$). Moderate correlation between VSS scales and VHQ: r from 0.19 to 0.41	Correlation between EEV items and the functional scale of AAO-HNS (from 0 to 6), in particular at the 4th week of follow-up: r from 0.62 to 0.81. Moderate correlation between EEV and the 8 dimensions of the SF-36 in particular at the 4th week of follow-up: r between 0.3 and 0.5	Not evaluated
Responsiveness	13 patients followed after an unilateral vestibular neurotomy. No quantified result of the VSS	In the 90 patients who improved on the AAO-HNS scale at the 4th week of follow-up, all the EEV scores improved ($P < 0.001$) Effect size†: Illusion of movement (1.5), duration of illusion (1.4), motion intolerance (1.28), neurovegetative symptoms 0.99), instability 1.26), and total score (1.75)	Not evaluated
Total number of patients	383	123	85

*Study of the correlations of the items compared with the whole of the questionnaire; †Effect size: ratio of mean change/standard deviation of this change.
AAO-HNS, American Academy of Otolaryngology—Head and Neck Surgery; BPPV, benign paroxysmal positional vertigo; EEV, European Evaluation of Vertigo; ENT, ear, nose, and throat; HAD, Hospital Anxiety and Depression Scale; MD, Meniere's disease; MD-POSI, Meniere's Disease Patients-Oriented Severity Index; SF-36, generic QoL questionnaire; VHQ, Vertigo Handicap Questionnaire; VSS, Vertigo Symptom Scale.

neurovegetative signs [33]. Because the EEV was partially completed by a clinician, interviewers' reproducibility was also checked. Four ENT specialists scored video recordings of 21 patients. Interviewer agreement was good for total EEV score and for four of the five items, with intraclass correlation coefficients ranging from 0.87 to 0.93. For duration of illusion, however, the coefficient was low (0.58).

The EEV questionnaires have the advantage of assessing only the cardinal symptoms of the vestibular syndrome. The reproducibility of the neurovegetative signs item and the interrater reliability of the duration of illusion item require revision. The level of agreement between patients' and clinicians' assessments should also be assessed. Lastly, it should be checked that no strong correlation exists between the five items of the EEV, especially between illusion of movement and duration of illusion items.

Meniere's Disease Patient-Oriented Severity Index (Table 5)

Meniere's Disease Patient-Oriented Severity Index (MD-POSI) has four dimensions: patients' symptoms and functional status during attacks; patients' symptoms and functional status between attacks; effect of the disease on patients' everyday activity; effect of the disease on patients' work [34,35]. From an initial pool of 30, the number of items was reduced to 20, with 16 items grouped into four dimensions, plus four single items. There is limited evidence of structural validity as a simple item–total correlation was performed, but not a factor analysis. Discriminant validity was demonstrated by changes in the total MD-POSI score (from 0 to 5) according to the answers on the global item "Overall, my disease has changed my life" ($P < 0.0001$). It should be noted that the patients selected for the validation study were not severely affected, with MD-POSI scores usually below 2 on a scale of 0 (no impairment) to 5 (severe impairment). Moreover, 81% of the patients answered that their health was good or excellent as compared with others of their age, 64% that they were satisfied or very satisfied with their Meniere's disease treatment, and 82% that they expected good or excellent health in the five coming years. Reproducibility, convergent validity, and responsiveness have not been tested.

Discussion and Conclusions

Assessment of vertigo and dizziness symptoms and QoL (or handicap) is useful. Several studies have shown weak or no correlation between symptoms and/or QoL (assessed by DHI, VADL, VSS) on the one hand and objective vestibular syndrome measurements (caloric test and posturography) on the other [1,2,22,40]. Thus, symptom and QoL questionnaires measure concepts that are not adequately captured by the usual so-called objective criteria. Patient assessment of symptoms and QoL is thus an added value in assessing treatment efficacy. Moreover, symptoms and QoL, although overlapping to some extent, refer to distinct concepts, as shown by the only moderate correlation between the EEV and SF-36 questionnaires [33]. Vertigo impact on QoL thus cannot be inferred from symptom assessment alone. All the identified questionnaires are self-administered (although the EEV also contains a clinician assessment): the patient is logically the best judge of changes in his/her symptoms and QoL. Estimates of the impact of vertigo on QoL differed between patients and physicians in the UCLA-DQ validation study [5]. It is well-established that physicians are more inclined to deem their patient's pain bearable than are the patients themselves, and that physicians tend to underestimate the intensity of pain, especially in diseases considered nonsevere by the medical community [4,41]. Thus, the patient's perspective is essential in the context of vertigo and dizziness, requiring self-assessment of both symptoms and of QoL, as these two measure distinct concepts.

Critical appraisal cast doubt on the validity of some of the 10 vertigo or dizziness questionnaires found, and especially the DHI. The VDI questionnaire had the best validation score (Fig. 1) being adequately developed, particularly for item generation, item reduction, reproducibility, discriminant, and convergent validity. The development and validation of symptom and QoL questionnaires must follow a rigorous procedure including item generation, item reduction, reliability, validity, and responsiveness, as well as translation and cultural adaptation if necessary [42–44]. It is an iterative process that usually involves several hundred patients and several studies. Fewer than 100 patients were included in the VHQ and MD-POSI validation studies. Moreover, the patients involved in validation studies should be representative of those having the disease. For the DHI and VDI validations, many patients had chronic pathology evolving over several years. For the UCLA-DQ, a great number of patients had psychogenic disorders and migraine. For the DFI, the definition of the validation population was vague. In contrast, the population of the VSS validation study was well-defined. Validation subjects should also have a minimum level of symptom severity and/or frequency. In addition, face validity can be difficult to assess, and none of the articles analyzed dealt with this issue. The working group, however, checked whether items appeared relevant or not to vertigo or dizziness patients.

Reproducibility is assessed by test–retest in stable patients. The majority of the studies had too small a sample for test–retest (DHI, VADL, ABC, VHQ)

[1,21,23,25], set a too short interval (DHI, VADL, VSS) [1,2,21], or did not used an appropriate statistical test (EEV) [25,33]. Comparison of scores should be in terms of a correlation coefficient (intraclass, kappa) [42]. An interval of at least 1–3 weeks between test and retest [24,26,33], and a number of patients higher [2,26,33] than 30, are probably necessary [8]. Item scaling is also important for the responsiveness of a questionnaire. Apart from the DHI, for which the three response choices seemed unable to detect small change, all the other questionnaires propose sufficiently broad answer options, such as an analogical visual scale or a Likert-type verbal scale. It is notable, however, that for a group of questionnaires intended to assess changes with treatment, few studies attempted to assess responsiveness adequately [26,33].

Recall period (the period to which the patients' answers must relate) is not mentioned for all questionnaires. Some questionnaires (DHI, VADL, ABC, VHQ, UCLA) ask for answers concerning the present time. The recall period should not be too long [2,34], because some patients are not able to remember symptoms more than a few weeks [26,33]. A recall period of 3 months (MD-POSI) or 1 year (VSS) is probably unsuitable for many clinical or research purposes.

Depending on the concepts being assessed by the questionnaire, the appropriate questionnaire assessment times, and thus the trial duration, may differ. To assess broad QoL impact (e.g., social functioning), patient-perceived changes may require more time than to evaluate changes in physical symptoms resulting from medical treatment, for example.

Respondent burden is not mentioned in any article. The respondent burden increases with the number of items and when items are irrelevant to the patient. The UCLA-DQ and EEV questionnaires, with five items only, probably have the smallest respondent burden, facilitating their practical use. In the UCLA-DQ, however, the single "impact on QoL" item is not enough for assessing the multidimensionality of QoL.

Lastly, the present review looked at questionnaires specific to vertigo and/or dizziness. Generic QoL questionnaires such as the SF-36, may not be sensitive enough to detect patient changes, as they fail to capture the specific impact of vertigo/dizziness. There may, however, be some value in including them for comparison across populations.

In summary, the questionnaires reviewed in this study have shown that most of those reflecting handicap or impact on QoL are not very specific to vertigo or dizziness, or have validation weaknesses. The VHQ appears to have the most pertinent content, but its validation remains to be completed. Mixed questionnaires have the same imperfections; the VDI had the best validation score, but its responsiveness appeared weak. As regards symptom questionnaires, the EEV seemed to assess the five major symptoms of vestibular syndrome satisfactorily and to be responsive.

In evaluating a symptomatic treatment for vertigo or dizziness in a clinical trial, it is of the greatest importance to include self-assessment of both symptoms and their repercussion in terms of handicap or QoL. Several questionnaires are thus necessary. The short EEV questionnaire may be suitable for symptom assessment. Regarding specific handicap or QoL questionnaires, the content of the VHQ appears relevant to the condition, but it appears that there is no enough psychometric evidence to support its use. A generic questionnaire is likely to lack responsiveness.

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