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ORIGINAL RESEARCH

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Living with dizziness impacts health-related quality of life among older adults

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Abstract

Objective: This study aimed to compare older adults reporting dizziness to those not reporting dizziness regarding health-related quality of life (HRQL), distress due to dizziness, and balance confidence. A secondary aim was to investigate potential association between HRQL, number of falls, balance confidence, and distress due to dizziness.

Methods: Patients coming for bone density measurements answered questions regarding occurrence of dizziness. Patients reporting dizziness on a daily or weekly basis were considered eligible and invited for investigation at the Ear, Nose and Throat clinic at Södra Älvsborg Hospital, Sweden. Patients not reporting dizziness were considered eligible as controls. All patients answered the Dizziness Handicap Inventory (DHI), Activity Balance Confidence Scale (ABC-scale), and Euro-QoL-5D-3L questionnaires.

Results: A total of 55 dizzy patients came for physical investigation and answered the questionnaires and 47 non-dizzy participants only answered the questionnaires. The dizzy participants reported lower levels of balance confidence, lower HRQL, more prior falls, and higher levels of distress due to dizziness than the non-dizzy controls. Lower levels of balance confidence and higher level of distress due to dizziness were each associated with lower HRQL.

Conclusion: Dizziness, unsteadiness, and low balance confidence are associated with HRQL in a negative way. This is important to consider when measuring HRQL in a senior population, since a sensation of unsteadiness may indirectly contribute to low HRQL together with other symptoms.

Level of evidence: 2b.

KEYWORDS
balance, dizziness, equilibrium, quality of life

1 | INTRODUCTION

Experience of dizziness is common among people over age 70 and as many as 30%–40% report having dizziness.[1,2] The condition is more common among women than among men, at least in younger ages,[2,3] and long-lasting dizziness can affect quality of life in a negative way.[1]

There are many reasons for experiencing dizziness in older ages. Conditions such as cardiovascular/neurological disease, peripheral

vestibular disorder, central vestibular disorder, or decreased postural control can each impact balance or induce dizziness.[4] Investigating the dizzy patient is thereby often challenging and a sensation of dizziness or imbalance can be present even though no obvious deficits can be identified. Among older adults, impairment or a decrease of several balance-controlling systems (vision, proprioception, vestibular, central nervous system) might occur and affect equilibrium.[3,4]

Health-related quality of life (HRQL) is often used to define overall well-being and measured for symptoms related to health. Maintaining balance and the ability to stand and move in an upright position are essential for living an independent life. Having dizziness may impact HRQL and living with balance disorders and dizziness are associated with reduced HRQL as well as self-rated health.[1,4–6]

Fear of falling and less balance confidence are symptoms among persons suffering from dizziness or imbalance, especially in advanced ages.[3] Having dizziness or disturbed balance are some of the highest risk factors for falls.[7–9] Fear of falling is often frightening, is associated with anxiety and is more common among persons who have already experienced a fall.[10] Fear of falling and losing balance can, however, also be symptoms experienced by people with no obvious balance disturbances, but may in the same way cause distress.

There are numerous questionnaires or patient-reported outcome measures (PROMs) to evaluate dizziness symptoms. The Dizziness Handicap Inventory (DHI) is probably the most widely used. The DHI is mainly applied to measure burden of handicap, or distress due to dizziness, rather than being useful as a disease indicator.[11] The associations between DHI and different diseases has been reported and are not conclusive[12,13] and patients with functional or phobic dizziness are often the ones with highest scores whereas patents with vestibular diseases more often have low scores.[14] High levels of distress due to dizziness may be reported among younger adults having anxiety and diagnosed with functional disorders, such as persistent positional perceptual dizziness (PPPD). This condition probably also exists among older adults, however is less described.[14]

Most studies evaluate patients seeking medical care due to dizziness in balance clinics, while fewer studies focus on patients with dizziness in general geriatric centers. This study aimed to investigate older adults reporting dizziness, in regards to HRQL, distress due to dizziness, and balance confidence, and compare them to those not reporting dizziness. The aim was also to investigate the association between HRQL and balance confidence, number of falls, and distress due to dizziness.

2 | MATERIALS AND METHODS

2.1 | Study population

All study participants were outpatients, aged 70–85 years, who were identified through the geriatric clinic, when they referred for bone density measurements at Södra Älvsborgs Hospital in Region Västra Götaland, Sweden. Reasons for referral for bone density measurements were; having a fracture, being on corticosteroids or other reasons.

Before the visit, the patients were provided with a screening questionnaire including questions about occurrence of dizziness, imbalance, and previous falls (Table 1). Patients reporting problems with dizziness or imbalance on a daily or weekly basis were considered eligible for clinical investigation and contacted by telephone. If they wanted to participate, they were invited to the ear, nose and throat (ENT) clinic at Södra Älvsborg Hospital, a secondary referral center, for examination. These participants are hereafter referred to as the dizzy group. Patient not reporting dizziness or having dizziness only once a month were eligible for the study as controls and were contacted by mail, hereafter referred to as the non-dizzy group. See Figure 1 showing flow chart of inclusion for the study. All patients coming for investigation (dizzy group) were examined by the same ENT doctor and underwent a standardized oto-neurological examination. They were also asked about symptoms of dizziness and previous falls within the last 12 months, medication use, medical conditions, and diseases. All participants, dizzy as well as non-dizzy, were asked to complete the questionnaires EQ-5D-3L VAS, the DHI, and the Activity Balance Confidence scale (ABC-scale).

2.2 | Patient-reported outcome measures

2.2.1 | EQ-5D-3L

EQ-5D is a generic instrument evaluating quality of life and consists of five sub-domains, namely mobility, self-care, usual activities, pain/discomfort, and anxiety/depression with three severity levels: no, moderate, or severe problems.[15] The Swedish version of the EQ-5D-3L was used and the Swedish value set, based on experienced health states, was applied for obtaining a health state utility score.[16] If the patient had no problems performing a task, they scored 1, those with some problems scored 2, and if they were unable to perform a task or had severe pain, they scored 3. Thus, the lower score, the better the HRQL. Patients also completed the EQ-5D-3L visual analog scale (VAS), rating their total health status between 0 (worst possible health) and 100 (best possible health).

2.2.2 | The Activities Balance Confidence Scale

The ABC-scale was used to measure self-reported confidence in maintaining balance while performing daily tasks.[17] It consists of 16 items and ranges from 0% to 100% confidence with higher scores representing higher balance confidence. Older adults scoring >80% are considered highly functional, 50%–80% indicates a moderate level of functioning, and <50% is considered to indicate a low level of functioning.[18]

TABLE 1 Presentation of the study cohort.

	Dizzy group ($n = 55$)	Non-dizzy group ($n = 47$)	p value
	Mean (SD)	Mean (SD)	
Age, years, mean (SD)	78 (4)	77 (4)	.08
	n (%)	*n* (%)	
Gender			
Women	52 (95)	39 (83)	.12
Men	3 (5)	8 (17)	
Missing	0	0	
Dizziness how often			
Every day	34 (62)	0 (0)	<.001
Every week	21 (38)	0 (0)	
Every month	0 (0)	14 (30)	
Every year	0 (0)	6 (13)	
Never	0 (0)	27 (57)	
Missing	0	0	
Dizziness how long			
Seconds	31 (61)	10 (59)	.78
Minutes	13 (24)	4 (24)	
Hours	7 (14)	3 (18)	
Not dizzy	0	27	
Missing	4	3	
Previous falls last 12 months			
0	24 (44)	39 (83)	.0002
1	9 (16)	7 (15)	
2	6 (11)	0 (0)	
>2	16 (29)	1 (2)	
Missing	0	0	

Note: For categorical variables, *n* (%) is presented. For comparison between groups, Fisher's exact test (lowest one-sided *p*-value multiplied by 2) was used for dichotomous variables and the Mantel–Haenszel Chi square test was used for ordered categorical variables and the Mann–Whitney *U* test was used for continuous variables.

2.2.3 | Dizziness Handicap Inventory

The DHI, translated into various languages and widely used since its development by Jacobson and Newman in 1990, is used to quantify subjective symptoms of dizziness and self-perceived impact of dizziness on everyday life.[19] The questionnaire consists of 25 questions where respondents are asked to indicate the degree to which their dizziness affects daily life across three domains (functional, emotional, and physical). The maximum total score is 100 points divided into 32, 40, and 28 points for the functional, emotional, and physical dimensions, respectively. The higher the score, the greater the level of handicap due to dizziness symptoms (also expressed as distress due to dizziness). The questionnaire has been translated into Swedish and shown sufficient reliability.[20] Cut-off points (total) have been defined with 0–14 points representing no handicap, 16–34 points mild handicap, 36–52 points moderate handicap, and ≥54 points representing severe handicap.[21]

2.3 | Ethical considerations

The study was conducted according to the Declaration of Helsinki and was approved by the Regional Ethic Review Board in Gothenburg, Sweden, reference number 710-16. Written informed consent for study participation was obtained from all participants prior to study conclusion.

2.4 | Statistical methods

For continuous variables, the mean, standard deviation (SD), and median was presented for descriptive purposes while number and percent were presented for categorical variables. For comparison between two groups, the Mantel–Haenszel Chi square test was used for ordered categorical variables, Fisher exact test for dichotomous variables, and the Mann–Whitney *U*-test or *t*-test for continuous

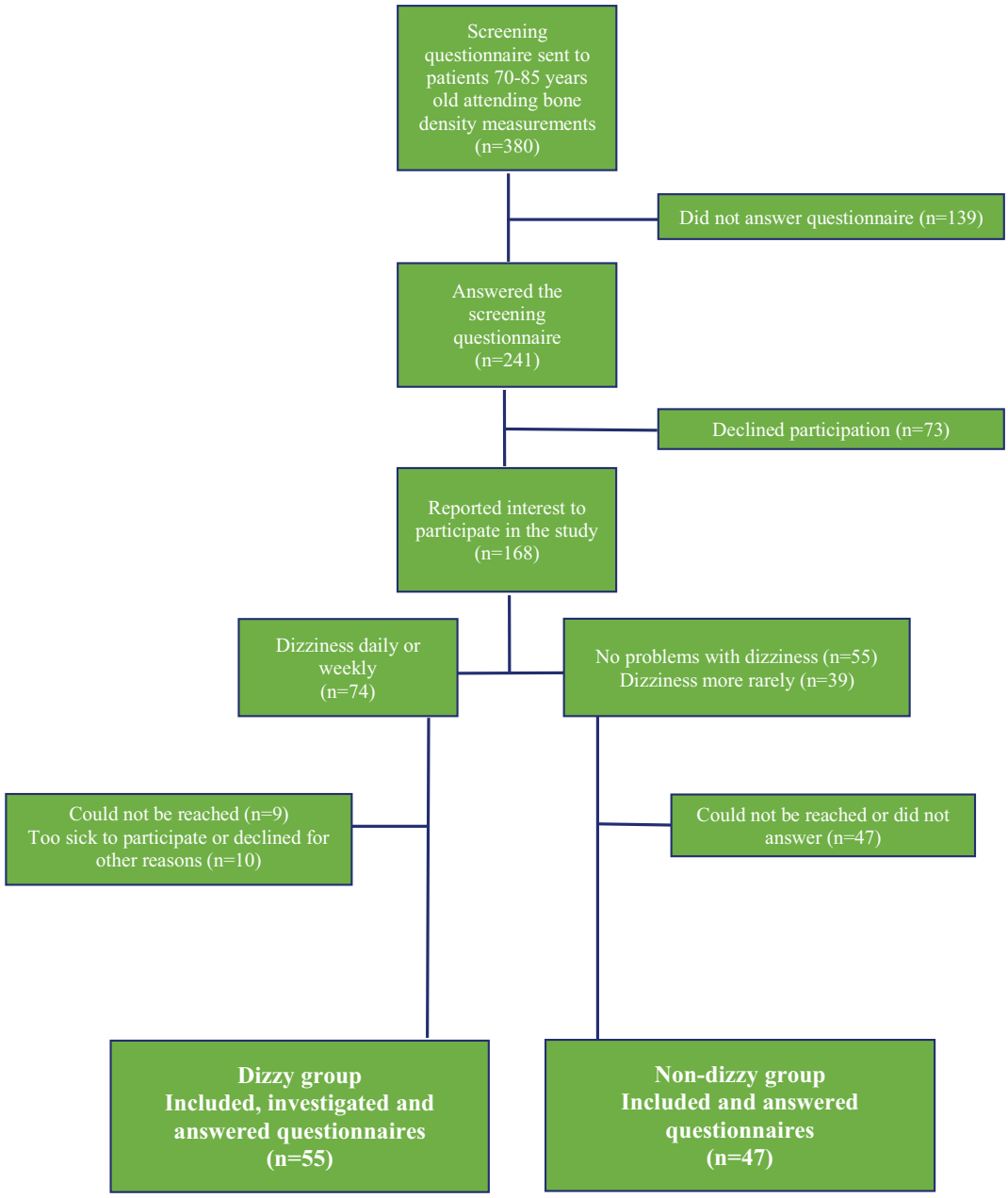

FIGURE 1 Flow chart of inclusion of study cohort.

variables. For comparison between three groups, the (ordered) Mantel–Haenszel Chi square test was used for ordered categorical variables and Spearman's rank test for continuous variables. Pearson correlation coefficients were used for correlation between EQ-5D health index score versus VAS, ABC, and DHI and Spearman rank correlation coefficients for EQ-5D health index score versus number of falls. All significance tests were two-sided and conducted at 5% significance level. SAS 9.4 was used for analyses. The strength of the association for absolute values of r were categorized: 0–0.19 was regarded as very weak, 0.2–0.39 as weak, 0.40–0.59 as moderate, 0.6–0.79 as strong, and 0.8–1 as very strong.[22]

3 | RESULTS

The participants in the dizzy and non-dizzy groups were similar in age and gender (screening questionnaire, Table 1). Participants in the dizzy group reported higher levels of distress in all PROMs. More than half of the dizzy participants (56%) had a fall in the past year compared to only 17% ($n = 8$) of the non-dizzy ($p = .0002$, Table 1). A total of 30 (55%) patients in the dizzy group were diagnosed with one or more conditions potentially affecting balance, with the following distribution: 15 (27%) benign paroxysmal positional vertigo (BPPV), 1 (2%) Meniere's disease, 9 (16%) central

TABLE 2 Questionnaire results (EQ-5D-3L, ABC-scale and DHI), for dizzy and non-dizzy groups.

	Dizzy group ($n = 55$)	Non-dizzy group ($n = 47$)	
EQ-5D-3L	***n* (%)**	***n* (%)**	***p*-value**
Mobility			
No problem	22 (40)	38 (84)	
Some problem	33 (60)	7 (15)	
Confined to bed	0 (0)	0 (0)	<.0001
Missing	0	2	
Self-care			
No problem	48 (87)	42 (93)	
Some problem	5 (9)	2 (4)	
Unable to wash or dress	2 (4)	1 (2)	.37
Missing	0	2	
Activity			
No problem	38 (69)	39 (87)	
Some problem	16 (29)	6 (13)	
Unable to perform	1 (2)	0 (0)	.033
Missing	0	2	
Pain			
No pain or discomfort	9 (16)	13 (29)	
Moderate pain or discomfort	41 (75)	31 (69)	
Extreme pain or discomfort	5 (9)	1 (2)	.057
Missing	0	2	
Anxiety			
Not anxious or depressed	27 (49)	40 (89)	
Moderately anxious or depressed	28 (51)	5 (11)	
Extremely anxious or depressed	0 (0)	0 (0)	<.0001
Missing	0	2	
VAS, mean (SD)	69 (14)	73 (23)	.24
Median	70	75	
n	55	45	
Health state index score, mean (SD)	0.826 (0.106)	0.910 (0.069)	<.0001
Activity Balance Confidence scale			
ABC total, mean (SD)	64 (17)	86 (18)	<.0001
Low functioning (<50p), *n* (%)	12 (23)	2 (4)	
Moderate functioning (50–80), *n* (%)	31 (60)	9 (20)	
High functioning (>80), *n* (%)	9 (17)	34 (76)	<.0001
n	52	45	
Dizziness Handicap Inventory, mean (SD)			
DHI, total (max 100p)	37 (21)	9.6 (13)	<.0001
No handicap, *n* (%)	9 (16)	35 (75)	
Mild handicap, *n* (%)	14 (26)	7 (15)	
Moderate handicap, *n* (%)	18 (33)	5 (11)	
Severe handicap, *n* (%)	14 (26)	0 (0)	<.0001
n	55	47	
Functional (max 32p), mean (SD)	13 (8)	3.2 (5)	<.0001
Physical (max 28p), mean (SD)	13 (7)	4.2 (5)	<.0001
Emotional (max 40p), mean (SD)	10 (8)	1.6 (4)	<.0001

Note: For categorical variables, *n* (%) is presented. For continuous variables, mean (standard deviation, SD) is presented. For comparison between groups, the Mantel–Haenszel Chi square test was used for ordered categorical variables and t-tests were used for continuous variables. For Dizziness Handicap Inventory (DHI), higher scores mean higher levels of distress due to dizziness. For Activity Balance Confidence scale (ABC), higher scores mean higher levels of balance confidence and a higher functional level.
Abbreviation: VAS, visual analog scale.

TABLE 3 Results from EQ-5D-3L and ABC stratified by low (<50), moderate (50–80), and high (>80) balance confidence.

	ABC			
EQ-5D-3L	Low functioning (<50) ($n = 14$)	Moderate functioning (50–80) ($n = 40$)	High functioning (>80) ($n = 43$)	*p*-value
Mobility				
No problem	0 (0)	19 (48)	40 (93)	<.0001
Some problem	14 (100)	21 (52)	3 (7)	
Confined to bed	0 (0)	0 (0)	0 (0)	
Selfcare				
No problem	11 (79)	36 (90)	42 (98)	.13
Some problem	3 (21)	2 (5)	0 (0)	
Unable to wash or dress	0 (0)	2 (5)	1 (2)	
Activity				
No problem	4 (29)	30 (75)	42 (98)	<.0001
Some problem	9 (64)	10 (25)	1 (2)	
Unable to perform	1 (7)	0 (0)	0 (0)	
Pain				
No pain or discomfort	1 (7)	6 (15)	13 (30)	.0047
Moderate pain or discomfort	11 (79)	30 (75)	30 (70)	
Extreme pain or discomfort	2 (14)	4 (10)	0 (0)	
Anxiety				
Not anxious or depressed	6 (43)	22 (55)	37 (86)	
Moderately anxious or depressed	8 (57)	18 (45)	6 (14)	
Extremely anxious or depressed	0 (0)	0 (0)	0 (0)	.0004
VAS, mean (SD)	54.6 (15.5)	68.9 (17.3)	78.6 (17.7)	<.0001
Health state index s score, mean (SD)	0.741 (0.083)	0.840 (0.099)	0.929 (0.036)	<.0001

Note: For categorical variables, *n* (%) is presented. For continuous variables, mean (standard deviation, SD)/median (min; max)/*n* is presented. For comparison between groups the Mantel–Haenszel Chi square test was used for ordered categorical variables and Spearman's rank correlation test was used for continuous variables.

vestibular disorder, 3 (5%) bilateral vestibulopathy, and 2 (4%) unilateral vestibulopathy. A total of 15 (27%) participants in the dizzy group reported vision impairment, while 22 (40%) used walking aids or wheelchair. Nineteen (35%) participants in the dizzy group had a fully normal oto-neurological examination including walking speed, where no objective reason for balance disturbance could be identified. Investigations for vestibular disorder for the dizzy group has been described and published elsewhere.[23,24] A total of 10 patients (25%), medicated with 1 or more medications considered inappropriate for older adults due to Swedish National Board of Health and Wellfare; 5 (9%) with sleep inducing medication, 2 (4%) with tramadol, 3 (5%) with codeine, and 4 (7%) with medications having anticholinergic effects.

3.1 | Patient-reported outcome measurements

The results from the EQ-5D and the ABC-scale are presented in Table 2. Participants in the dizzy group had significantly worse scores measuring quality of life (EQ-5D) in the domains of *Mobility*, *Activity*, and *Anxiety* compared to the non-dizzy. No differences between dizzy and non-dizzy groups were seen regarding levels of self-rated wellness (VAS). The dizzy group reported lower levels of balance confidence compared to the non-dizzy group.

In Table 3, results from the EQ-5D were divided into three categories representing low (<50), moderate (50–80), and high (>80) balance confidence from the ABC-scale. Lower balance confidence was associated with lower HRQL in every domain except self-care. As presented in Figure 2A, there was also a strong correlation between lower HRQL measured with the EQ-5D-3L health state index score and lower balance confidence (ABC total), $r = 0.70$, $p < .0001$. There was a moderate correlation between VAS and ABC-total, $r = 0.46$, $p < .0001$.

DHI scores are found in Table 2. Mean total score of DHI for patients in the dizzy group was 37p, compared to 9.6p in the non-dizzy group ($p < .0001$). In the dizzy group, a total of 23 (42%) patients reported no or mild symptoms of dizziness (<34p) measured with DHI, although still reported having problems with dizziness. Patients in the

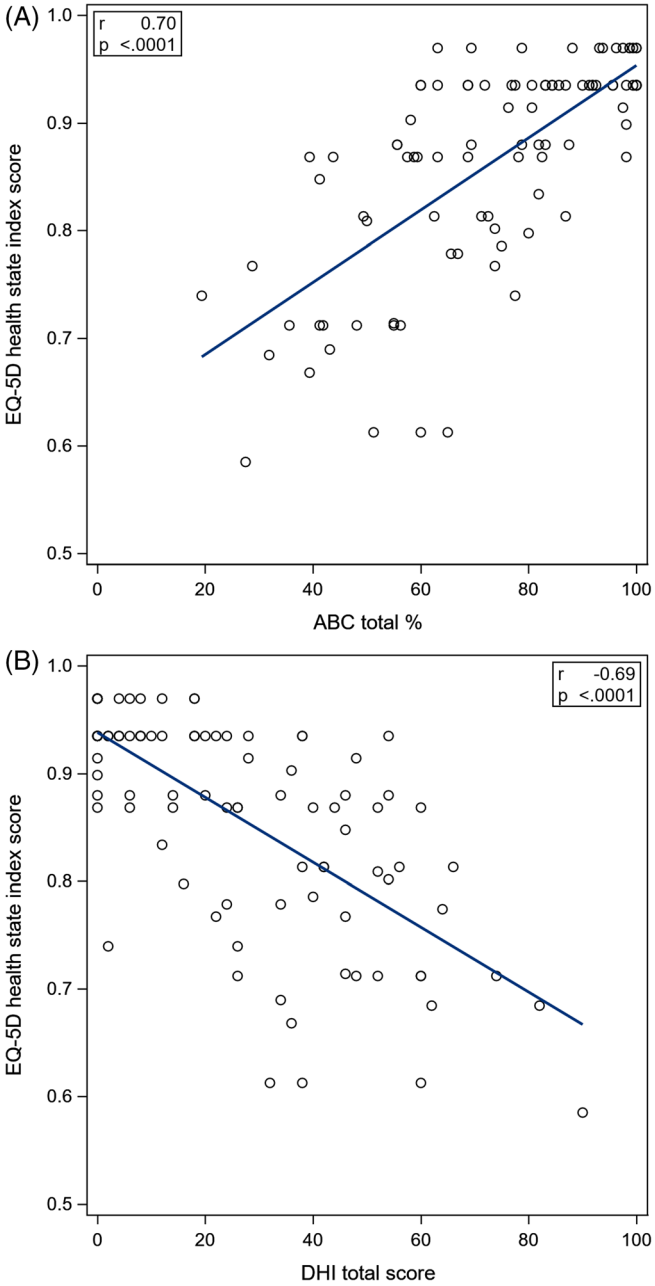

FIGURE 2 (A) Association between health-related quality of life (HRQL, as measured using EQ-5D-3L) and balance confidence (measured using the Activity Balance Confidence, ABC, scale), $r = 0.70$, $p < .0001$. On this scatterplot for HRQL and ABC-scale, higher scores mean higher levels of balance confidence and a higher functional level. Higher levels of EQ-5D-3L health state index score means better HRQL. Pearson correlation. (B) Association between health-related quality of life (HRQL, measured using EQ-5D) and distress due to dizziness (measured using Dizziness Handicap Inventory, DHI), $r = -0.69$, $p < .0001$. On this scatterplot for HRQL and DHI, a higher the scores indicate a higher level of distress due to dizziness. Higher levels of EQ-5D-3L health state index score indicate better HRQL. Pearson correlation.

non-dizzy group had a mean score of 9.6p on DHI, synonymous with no problems on the scale. In the non-dizzy group, a total of 42 (89%) patients reported no or mild symptoms and 5 (11%) reported moderate symptoms measured with DHI. In Table 4, the EQ-5D-3L results were divided into categories of the DHI indicating no, mild, moderate, and severe handicap due to dizziness. Higher levels of distress due to dizziness (DHI total) was associated with lower HRQL in every domain except self-care. As presented in Figure 2B, strong correlation was seen between lower HRQL (EQ-5D-3L health state index score) and higher levels of distress due to dizziness (DHI total) $r = -0.69$, $p < .0001$. There was a moderate correlation between VAS and DHI total, $r = -0.45$, $p < .0001$.

A weak correlation was found between number of falls and HRQL, especially for those participants who had experienced a higher number of falls and reported lower, that is, worse, HRQL (EQ-5D-3L health state index score), $r = -0.32$, $p = .0013$, Figure 3. Weak correlation was also found between number of falls and balance confidence (ABC total), $r = -0.31$, $p = .0021$ and moderate correlation between number of falls and distress due dizziness (DHI total), $r = 0.42$, $p < .0001$.

4 | DISCUSSION

In this study investigating older adults reporting dizziness, for HRQL, distress due to dizziness and balance confidence, we found that dizzy participants reported worse HRQL and lower balance confidence than the non-dizzy participants. The difference was seen both in the generic instrument EQ-5D-3L, as well as in the symptom-specific instruments DHI and the ABC-scale. We found that dizzy participants had lower scores in the EQ-5D-3L domains of *Mobility*, *Activity*, and *Anxiety* compared to non-dizzy participants. However, no statistically significant difference was reported using the self-rated VAS between the dizzy and non-dizzy groups. Strong correlations were found between lower balance confidence and lower HRQL (EQ-5D-3L health state index score) as well as between more dizziness symptoms (DHI total) and lower HRQL. Additionally, moderate correlations were found between lower levels of balance confidence and lower VAS score, as well higher levels of distress due to dizziness, and lower VAS. In VAS, the participants rated their total health status between worst or best possible status and it is interesting how essential balance confidence and reduced symptoms of dizziness seem to be for maintaining high levels of self-rated total health status.

Being able to move unrestricted is essential for living an independent and self-determining life, and this is possibly the reason for the strong association between HRQL and balance. It might thereby not be surprising that there is an association between a decline in HRQL when measured with a generic PROM like EQ-5D-3L, and impaired balance, when considering how the questions are phrased. For example, in the domains *Mobility* and *Activity*, problems when walking and to manage daily activities, respectively, are targeted and both involve locomotion, which is commonly impaired when having dizziness or balance disturbance. It is remarkable how balance and the ability to move independently impact when defining and measuring HRQL. This is something that may need to be considered when using generic PROMs for evaluating HRQL among older adults with chronic

TABLE 4 Results from EQ-5D-3L and DHI divided into categories representing no, mild, moderate, or severe handicap due to dizziness.

	DHI				
EQ-5D-3L	No handicap (0–14) ($n = 44$)	Mild handicap (16–32) ($n = 21$)	Moderate handicap (34–52) ($n = 23$)	Severe handicap (54–100) ($n = 14$)	*p*-value
Mobility *n* (%)					
No problem	39 (91)	12 (60)	7 (30)	2 (14)	
Some problem	4 (9)	8 (40)	16 (70)	12 (86)	
Confined to bed	0 (0)	0 (0.0)	0 (0)	0 (0)	<.0001
Selfcare					
No problem	41 (95)	18 (90)	21 (91)	10 (71)	
Some problem	1 (2.5)	1 (5)	1 (4.5)	4 (29)	
Unable to wash or dress	1 (2.5)	1 (5))	1 (4.5)	0 (0)	.13
Activity					
No problem	41 (95)	15 (75)	16 (70)	5 (36)	<.0001
Some problem	2 (5)	5 (25)	6 (26)	9 (64)	
Unable to perform	0 (0)	0 (0)	1 (4)	0 (0)	
Pain					
No pain or discomfort	14 (33)	3 (15)	3 (13)	2 (14)	
Moderate pain or discomfort	29 (67)	16 (80)	17 (74)	10 (71)	
Extreme pain or discomfort	0 (0)	1 (5)	3 (13)	2 (14)	.0062
Anxiety					
Not anxious or depressed	39 (91)	15 (75)	9 (39)	4 (29)	
Moderately anxious or depressed	4 (9)	5 (25)	14 (61)	10 (71)	
Extremely anxious or depressed	0 (0)	0 (0)	0 (0)	0 (0)	<.0001
VAS mean (SD)	78.1 (19.0)	74.6 (12.2)	60.6 (19.4)	59.6 (12.2)	<.0001
Health state index score, mean (SD)	0.93 (0.045)	0.86 (0.098)	0.81 (0.090)	0.76 (0.102)	<.0001

Note: For categorical variables, *n* (%) is presented. For continuous variables, mean (standard deviation, SD)/median (min; max)/*n* is presented. For comparison between groups, the Mantel–Haenszel Chi square test was used for ordered categorical variables and Spearman's rank correlation test was used for continuous variables.

diseases, as dizziness and subjective balance disturbance is common among this group and may thereby decrease the total score of HRQL in addition to the disease itself.

A difference in number of prior falls between the dizzy and non-dizzy group was observed, which was expected, as dizziness causes imbalance and risk for falling. This was also reflected in the HRQL, where worse HRQL was associated to the number of previous falls and this trend was more evident in participants with more than one previous fall. This is an important aspect, since fear of losing balance and falling may be major concerns in higher ages[10] and loss of balance is reported to be the second most common reason for falling among older adults (after stumbling).[9] In the present study, the dizzy participants reported higher of levels of anxiety than the non-dizzy group. This may be explained by previous reports, where low balance confidence, also referred to as fear of falling, may interact with HRQL in a negative way[8] and fear of falling can exist also among individuals with high functional status and no obvious balance problem, where the fear can be difficult to treat. Even if fear of falling is, in many cases, a natural and adaptive response to challenging situations, preventing people from participating in risky behavior, it may also be irrational or phobic and triggered by fear. The fear and avoidance of movement and not participating in activities can lead to more inactive behavior, isolation, and potentially even loneliness.

Dizziness is a common reason for seeking medical care and management of the dizzy patient is challenging since dizziness and imbalance can be a result from many causes, the majority benign.[25] In the present study, 35% of the patients in the dizzy group had a fully normal oto-neurological examination. This is in line with previous investigations reporting that as many as 20%–40% of all patients seeking medical care due to dizziness have no specific diagnosis set, and reasons for the balance complaints remain unknown.[26] Among older adults, reasons for dizziness can be multi-causal and finding reasons for dizziness or impaired balance can be particularly challenging. The presence of persistent dizziness can lead to psychological stress, and the absence of plausible diagnosis can possibly increase that stress and enhance a feeling of not having control or predictability. This could also partly explain the reduced HRQL in the dizzy group, even though 65% of the participants were documented as having a normal oto-neurological examination, that is, no apparent reason for their balance impairment.

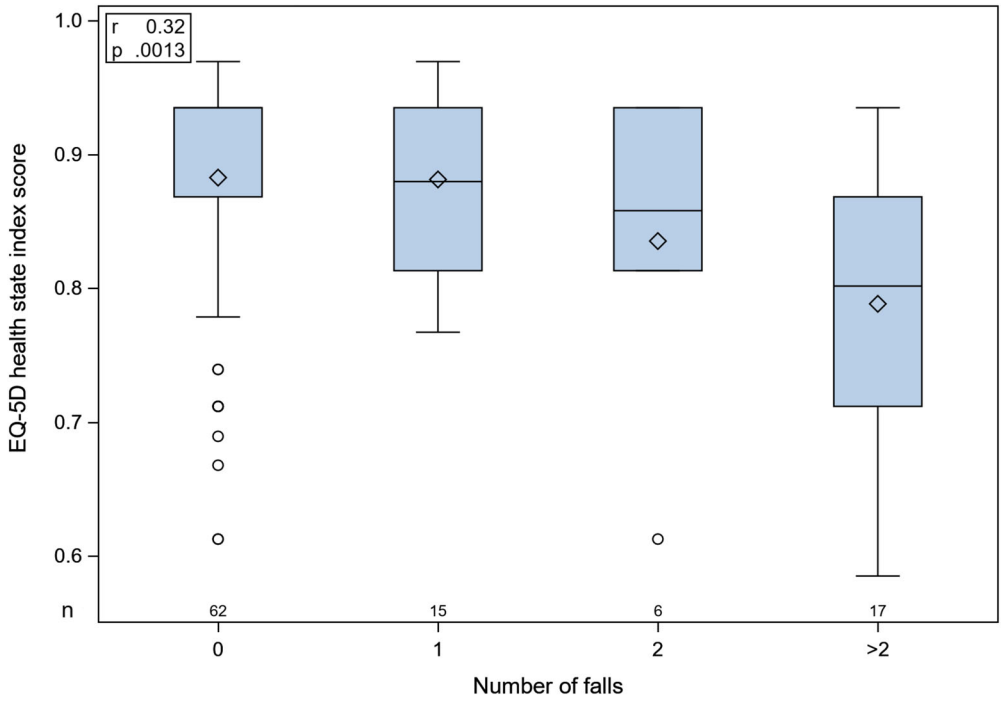

FIGURE 3 Association between health-related quality of life (HRQL measured with EQ-5D) and falls. On this boxplot showing number of falls on this boxplot showing number of falls and EQ-5D. Higher levels of EQ-5D indicate better HRQL. Spearman correlation.

4.1 | Strengths and limitations

This study is one of few to perform an oto-neurological examination to investigate older individuals not actively seeking medical care for dizziness. The design of the study is non-randomized making interpretations of the result comparing the group must be made with some carefulness. Limitations are the small study populations, risk of recall bias regarding dizziness episodes and falls, a relatively big drop out and that the participants in the non-dizzy group were not investigated but only answered study-specific questions and PROMs. Other limitations are the relatively low response rate and the big drop out.

4.2 | Conclusion

Dizziness, unsteadiness, and low balance confidence are associated with HRQL in a negative way. This is important to consider when measuring the HRQL in a senior population, since the sensation of unsteadiness may indirectly contribute to low HRQL together with other symptoms.

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CONFLICT OF INTEREST STATEMENT

No conflict of interests.

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