



# Mental Health Education and Utilization Among Patients with Vestibular Disorders

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## Abstract

To explore the receipt of mental health education, assessment, and referrals, and mental health service use among individuals with vestibular disorders. Patients with vestibular disorders living in the US, Australia, Canada, and the UK were surveyed through social media forums. Questionnaires assessed demographics, anxiety (Generalized Anxiety Disorder-7), depression (Center for Epidemiological Studies Depression-10), dizziness (Dizziness Handicap Inventory), and type of professional providing mental health education, assessment, referral, and treatment. The 226 participants were largely White (90%), educated (67% holding an associate's degree or higher) women (88%) with an average age of 45 who self-identified as having chronic vestibular symptoms (78%), as opposed to episodic ones (22%). Fifty-two percent reported never receiving verbal education, written education (69%), mental health assessment (54%), or referral (72%). Participants were more likely to receive mental health treatment in the past if they had received verbal resources and/or referrals from clinicians. The majority of patients with vestibular disorders report that medical professionals have not provided education, mental health assessment, or a mental health referral.

**Keywords** Vestibular disorders · Vestibular dysfunction · Integrated behavioral health · Mental health screening

## Introduction

Vestibular disorders are disorders of the inner ear balance organs and/or central nervous system and include diagnoses such as vestibular migraine (VM), Meniere's Disease (MD), benign paroxysmal positional vertigo (BPPV), and vestibular neuritis (VN), among others. Individuals with vestibular disorders are three times more likely to experience anxiety, depression, and panic disorder compared to the general population (Bigelow et al., 2016; Eckhardt-Henn et al., 2003; Garcia et al., 2003; Grunfeld et al., 2003; Ketola et al., 2007; McKenna et al., 1991). Unaddressed mental health conditions negatively impact patient outcomes in individuals with vestibular disorders, but screening for mental health

conditions in this population has not been well established (MacDowell et al., 2018; Staab, 2000, 2016, 2019; Whitney et al., 2020). Some literature demonstrates that these mental health conditions align with diagnoses known to take a chronic course, specifically vestibular migraine and Meniere's Disease (Eckhardt-Henn et al., 2008; Staab, 2012). By contrast, other studies suggest that a previous history of anxiety and depression acts as a risk factor, regardless of vestibular diagnosis (Best et al., 2009a, 2009b; Staab et al., 2014). Further, other researchers have found anxiety to occur more often with illnesses that activate rather than diminish vestibular function (Best et al., 2009a, 2009b; Brandt & Dieterich, 2020).

Given conflicting data in the aforementioned studies about identifying specific risk factors for the development of mental health conditions after onset of vestibular illness, it is difficult to target a subgroup for mental health screening. Thus, mental health conditions should be screened for all patients with complex or prolonged vestibular symptoms to reduce symptoms and improve quality of life (Eckhardt-Henn et al., 2008; Horii et al., 2004; Staab, 2000, 2019;). Common screening tools in the public domain include the Patient Health Questionnaire-9 (PHQ-9; Kroenke et al.,

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2001) and Generalized Anxiety Disorder-7 (GAD-7; Spitzer et al., 2006) or their composite score, the Patient Health Questionnaire Anxiety and Depression Scale (PHQ-ADS; Kroenke et al., 2016), or the Hospital Anxiety and Depression Scale (HADS; Zigmond & Snaith, 1983). There is some evidence that mental health screening instruments are feasible to administer in the neurotologic clinic setting (Herdman et al., 2020).

Patients with vestibular concerns who pursue mental health care enjoy better outcomes. Research demonstrates that psychological interventions can be effective in reducing symptoms of anxiety, depression, and dizziness. Strong evidence exists for the use of Cognitive Behavioral Therapy (CBT) and more limited evidence exists for Acceptance and Commitment Therapy (ACT) with this population..

A small randomized trial of CBT plus vestibular rehabilitation suggested improvement in dizziness symptoms compared with waitlist controls in 19 patients (Johansson et al., 2001). A larger study ( $N=167$ ) combining mindfulness, CBT, and vestibular rehabilitation in a group format found that after group treatment, participants reported improved mood, mental health, functioning, coping skills, and limitations from dizziness (Naber et al., 2011). Further, a study examining whether 32 participants would benefit from a combination of vestibular rehabilitation, psychoeducation, and CBT demonstrated improvement in psychological measures only for participants who demonstrated normal balance at the start of the study and not pathological balance (Schmid et al., 2018). Moreover, 91 patients with PPPD were studied using random assignment to sertraline alone or sertraline combined with CBT. Dizziness, anxiety, and depression decreased in both groups, but the group assigned to sertraline and CBT was significantly lower than the control group (Yu et al., 2018). In another study, 41 patients with PPPD were assigned to CBT or waitlist control; results suggested that the patients in the CBT group experienced significant reductions in dizziness, avoidance, and safety behaviors, but not in anxiety, depression, or stress (Edelman et al., 2012). Multiple studies have found that improvements in dizziness and mental health symptoms maintained at 6-month follow-up (Mahoney et al., 2013; Waterston et al., 2021). The combination of vestibular rehabilitation with CBT can help patients to break a maladaptive cycle of balance control (Popkirov et al., 2018).

Research support for ACT with the vestibular disorders population is more sparse. A study following 27 participants with persistent postural perceptual dizziness (PPPD) for 6 months found that 20 out of 27 participants who completed a combination of ACT and vestibular rehabilitation achieved remission and/or treatment response (Kuwabara et al., 2020). Though literature demonstrates effectiveness of mental health interventions to treat anxiety, depression, and dizziness in the vestibular population, it is unclear how often

medical clinicians educate, screen, and refer these patients for mental health treatment.

Taken together, robust evidence suggests that mental health conditions exist among patients with vestibular disorders and evidence-based treatments exist. However, there is a paucity of research on whether health professionals who treat vestibular disorders include mental health education, screening, and referrals with their patients. The purpose of this study is to explore how often medical clinicians engage in education, screening, and referrals and if care is related to severity of mental health symptoms and dizziness. Surveying patients is important to gain a clearer understanding of their perception of care received and could be compared infuture to a survey of medical professionals' perception of care provided. Results will provide insight into potential areas for education and training for these clinicians with the ultimate goal of improving vestibular patient outcomes. Moreover, there is a paucity of research investigating factors that contribute to help-seeking among individuals with vestibular disorders. Therefore, this study aims to examine whether having received mental health education, assessment, and/or referrals leads to higher likelihood of seeking mental health treatment.

## Materials and Methods

### Participants

In January 2022, participants were recruited from two English-language Facebook groups that offer general vestibular support (Vestibular Hope and Vestibular Disorders Support) as well as through the social media accounts used to promote the first author's business, which provides virtual behavioral health education for individuals with vestibular disorders. Data were collected anonymously. As such, the first author was blind to participation of former or current clients. Participants' eligibility for the study was not affected by current or prior business relationships and participation provided no compensation or other change in the business relationship between a client and the first author. Participants were excluded if they were younger than 18 or did not self-identify as having a vestibular disorder diagnosis. Participants included those living in the US, UK, Australia, and Canada. Participants provided informed consent prior to completing the online survey. This study qualified for exemption by the institutional review board at Old Dominion University (1840983).

### Procedure

Participants completed the survey via Qualtrics. The survey was estimated to take each participant 10–15 min to

complete. All questions were closed, and participants could select multiple answers related to vestibular disorder diagnoses and care received. The demographics and medical care questionnaires are included as supplementary material.

## Measures

### Demographics Questionnaire

Questions regarding gender, race, country of residence, education, and nature of vestibular disorder were included. Education was dichotomized, such that for education 0 = received less than an associate's degree and 1 = received an associate's degree or higher. It was hypothesized that individuals who had received an associate's degree or higher may be treated differently than those who lacked any form of college education, such that people who lack a college education may be less likely to receive mental health resources, referrals, and assessments.

### Generalized Anxiety Disorder-7 (GAD-7; Spitzer et al., 2006)

The GAD-7 is a 7-item self-report questionnaire that assesses generalized anxiety symptoms. The GAD-7 demonstrates reliability and validity in both psychiatric and community samples (Johnson et al., 2019; Löwe et al., 2008). Internal consistency for GAD-7 in this sample was good with a Cronbach's alpha of 0.88. Sixty-three percent of the sample reported at least mild levels of anxiety (Spitzer et al., 2006).

### Center for Epidemiologic Studies—Depression Mood Scale (CES-D-10; Andresen et al., 1994)

The CES-D-10 is a 10-item self-report questionnaire that measures current depressive symptoms. Higher scores suggest greater severity of depressive symptoms. The CES-D-10 has been validated in both psychiatric and community samples and demonstrated adequate reliability as well as convergent, divergent, and construct validity (Björngvinsson et al., 2013; Mohebbi et al., 2018). Internal consistency for the CES-D-10 in our sample was considered questionable with a Cronbach's alpha of 0.62. Sixty-eight percent of the sample scored above a 10 (the cutoff score for depression; Andresen et al., 1994).

### Dizziness Handicap Inventory (DHI; Jacobson & Newman, 1990)

The DHI is a 25-item self-report questionnaire that measures self-perception of vestibular symptom impact on functional, emotional, and physical domains. The DHI has been validated in the vestibular population with adequate internal

consistency, test-retest reliability, and variable concurrent validity (Enloe & Shields, 1997; Fielder et al., 1996; Jacobson & Newman, 1990; Whitney et al., 2004). DHI Cronbach's alpha for the current sample was considered good at 0.83. Participants in this sample reported an average DHI score of 61.38 (SD = 17.96). The DHI does not have cut-off scores; scores range from 0 to 100, with higher scores reflecting greater perceived handicaps due to dizziness (Jacobson & Newman, 1990).

### Mental Health Education and Assessment

Participants were asked to complete a questionnaire evaluating various types of mental health-related education and referrals, secondary to their vestibular diagnosis. Separate questions were included about verbal education, written education/resources, mental health assessment, and referral. Participants were asked to identify what type of medical practitioner provided them education, assessment, or referral (physician [and type of physician], physical therapist, nutritionist, chiropractor, none, or other). Finally, participants who received a mental health referral were asked to indicate if they sought treatment with that referral. Two separate dichotomous variables were calculated to assess whether a participant was currently receiving mental health treatment or received treatment in the past whereby 0 = not currently receiving any form of mental health treatment or did not receive therapy in the past and 1 = at least one form of current mental health treatment was reported or at least one form of mental health treatment was reported in the past).

### Mental Health Treatment

Participants reported whether they were currently receiving or received (in the past but after their vestibular diagnosis) any of the following types of mental health treatment: psychotherapy or counseling; pharmacotherapy or medication; or other mental health treatment (e.g., substance abuse treatment).

## Results

### Participants

In total, 257 people with self-reported vestibular diagnoses completed the survey. Of these individuals, 11 were removed from analyses for incorrectly answering one or more validity checks (e.g., "please select the number 6"). Of these 246 people, the majority ( $N = 226$ ) were from Australia, Canada, the United Kingdom, or the United States; these participants were retained for analysis.

The sample consisted largely of White females with an average age of 45 (SD= 13.52). Participants within the sample were more likely to identify with having “symptoms all the time” compared to “discrete episodes with a return to baseline in between,” and the majority of participants

reported receiving an associate’s degree or higher. Vestibular migraine (VM) represented more than double the prevalence of any other vestibular disorder diagnosis. Detailed demographic and diagnostic information can be found in Table 1.

**Data Preparation**

Prior to conducting analyses, data were cleaned and analyzed for missing data patterns. Responses were removed if they did not complete the survey beyond the basic demographic information or were duplicate entries. Missingness was low, ranging from 3 to 6%. Little’s Missing Completely at Random (MCAR) test demonstrated that data were missing completely at random, and expectation maximization (EM) imputation was used to address missing continuous data for participants who provided at least one response on a given scale. Total scores were created in congruence with recommendations from initial scale development articles (e.g., Andresen et al., 1994). No univariate outliers were detected using box plots. Multivariate outliers were assessed using leverage, discrepancy, and influence measures. The results of the measures were all within normal limits as assessed by histograms. Skewness and kurtosis for all variables were within normal limits falling between ±3. All variables were normally distributed (SPSS 28.0).

**Frequency of Receiving Mental Health Resources, Assessments, and Referrals**

Descriptive analyses found that 52% of participants had never received verbal mental health education, 69% had never received written education, 54% had never had their mental health assessed, and 73% had never received a mental health referral (Table 2). Physicians and physical therapists were most likely to provide education whereas physicians were more likely to assess and refer (Table 2). If participants reported any form of mental health education, assessment, or referral from a physician, participants then specified the type of physician who provided that education, assessment,

**Table 1** Demographics

|                               |               |
|-------------------------------|---------------|
| Number of participants        | 226           |
| Age                           | 45.23 (13.52) |
| Gender                        |               |
| Female                        | 198 (87.6%)   |
| Male                          | 28 (12.4%)    |
| Race/Ethnicity                |               |
| American Indian               | 3 (1.3%)      |
| Asian                         | 6 (2.7%)      |
| Black                         | 2 (0.9%)      |
| Multiracial                   | 3 (1.3%)      |
| White                         | 203 (89.8%)   |
| Other                         | 8 (3.5%)      |
| Hispanic                      | 15 (6.6%)     |
| Education                     |               |
| None                          | 0 (0%)        |
| Some high school              | 11 (4.9%)     |
| High school diploma/GED       | 30 (13.3%)    |
| Some college                  | 33 (14.6%)    |
| Associate’s degree            | 85 (37.6%)    |
| Bachelor’s degree             | 55 (24.3%)    |
| Master’s degree               | 9 (4.0%)      |
| Doctoral degree               | 3 (1.3%)      |
| Country of Residence          |               |
| Australia                     | 14 (6.2%)     |
| Canada                        | 17 (7.5%)     |
| UK                            | 16 (7.1%)     |
| USA                           | 179 (79.2%)   |
| Nature of Vestibular Disorder |               |
| Episodic                      | 50 (22.1%)    |
| Chronic                       | 176 (77.9%)   |

**Table 2** Receipt of mental health education, referrals, and assessment by provider type

| Variable          | Provider type |                        |                  |                  |           |          |
|-------------------|---------------|------------------------|------------------|------------------|-----------|----------|
|                   | Physician (%) | Physical Therapist (%) | Nutritionist (%) | Chiropractor (%) | Other (%) | None (%) |
| Verbal education  | 28            | 30                     | 2                | 4                | 5         | 52       |
| Written education | 17            | 16                     | <1               | <1               | 4         | 69       |
| Referral          | 17            | 6                      | 0                | 0                | 6         | 73       |
| Assessment        | 32            | 17                     | <1               | 2                | 7         | 54       |

Referral = whether participant received a referral for mental health  
 Assessment = whether participant was assessed for mental health symptoms  
 Participants were able to select multiple providers

**Table 3** Receipt of mental health education, referrals, and assessment by physician type

| Education         | Physician type   |         |               |                        |           |
|-------------------|------------------|---------|---------------|------------------------|-----------|
|                   | Primary care (%) | ENT (%) | Neurology (%) | Emergency medicine (%) | Other (%) |
| Verbal education  | 36               | 54      | 55            | 8                      | 15        |
| Written education | 36               | 52      | 48            | 7                      | 10        |
| Referral          | 71               | 12      | 24            | 0                      | 10        |
| Assessment        | 66               | 21      | 29            | 4                      | 11        |

Education by physician type for those who received education from a physician

Referral = whether participant received a referral for mental health

Assessment = whether participant was assessed for mental health symptoms

Participants were able to select multiple physicians that provided them resources

or referral. Mental health education was most often provided by primary care physicians, ENTs, or neurologists. However, primary care physicians, almost exclusively, were the ones who made mental health assessments and referrals (Table 3).

### Mental Health Resources, Assessments, and Referrals by Demographic and Disorder-Specific Variables

Chi square tests were conducted to assess whether being provided mental health education, assessments, and referrals varied as a function of demographic (e.g., gender) and disorder-specific factors (i.e., nature of vestibular disorder), whereby demographic and disorder-specific variables were entered as the independent variables and mental health education provided, assessment, and referral were dependent variables. These tests revealed that men were more likely to report receiving written education than women, but there were no other significant differences based on gender. Patients were more likely to report that their clinicians provided education, assessment, and referrals when they experienced “symptoms all the time” compared to “discrete episodes with a return to baseline in between.” There were no differences in receipt of education, assessment, or referral based on specific vestibular disorder. Participants with at least an associate’s degree were more likely to have received a mental health assessment, but there were no other significant differences based on education level. Individuals residing in Canada were less likely to be provided verbal education about mental health education compared to the other three countries in the sample; there were no other differences based on country of residence. Results can be found in Table 4.

### Severity of Mental Health and Disorder-Specific Symptom Associations with Mental Health Education, Assessments, and Referrals

Logistic regression analyses were used to examine whether the severity of vestibular disorder symptoms (measured by the DHI) and mental health symptoms (measured by the

GAD-7 and CES-D-10) were associated with an increased likelihood of reporting mental health service use (either currently or in the past). Further, moderation by clinician-provided education, assessment, and referral was explored. The odds of currently receiving treatment for mental health symptoms were 1.75 times higher with every one standard deviation (SD) increase in depression scores. There were no significant associations between dizziness or anxiety and currently receiving mental health treatment. The odds of seeking treatment for mental health symptoms in the past (but after a participant received a vestibular diagnosis) were 1.88 times higher for every one SD increase in depression scores and 1.56 times higher for every one SD increase in anxiety, but there was not a significant association when dizziness was the independent variable and seeking treatment in the past was the dependent variable.

Provision of verbal education and referrals moderated the associations between dizziness, depression, and anxiety, and seeking mental health treatment in the past (but after a vestibular diagnosis), such that participants were more likely to receive mental health treatment in the past if they had received verbal resources and/or referrals from clinicians. Table 5 contains model statistics for logistic regression analyses.

## Discussion

This study evaluated patient self-report of mental health education by medical providers and mental health treatment-seeking behavior in patients with vestibular disorder diagnoses. The majority of patients with self-reported vestibular disorders indicated that medical providers have not educated, assessed mental health, or provided a mental health referral. However, those who received verbal education and/or referral were more likely to have sought mental health treatment in the past, highlighting the importance of this clinical intervention.

**Table 4** Receipt of mental health education, referrals, and assessment by demographic and disorder-specific variables

| Variable             |                          | $\chi^2$                 | $\phi$ | $p$      |       |          |
|----------------------|--------------------------|--------------------------|--------|----------|-------|----------|
| Gender               | Male (%)                 | Female (%)               |        |          |       |          |
| Verbal education     | 57                       | 47                       | 0.05   | .01 .490 |       |          |
| Written education    | 50                       | 28                       | 2.72*  | .11 .010 |       |          |
| Referral             | 32                       | 27                       | 0.00   | .00 .565 |       |          |
| Assessment           | 61                       | 44                       | 0.59   | .05 .279 |       |          |
| Nature of Disorder   | Episodic (%)             | Chronic (%)              |        |          |       |          |
| Verbal education     | 42                       | 50                       | 2.18   | .10 .076 |       |          |
| Written education    | 30                       | 31                       | 0.21   | .03 .389 |       |          |
| Referral             | 34                       | 49                       | 2.35   | .10 .056 |       |          |
| Assessment           | 18                       | 31                       | 2.60*  | .11 .027 |       |          |
| Education            | < Associate's degree (%) | ≥ Associate's degree (%) |        |          |       |          |
| Verbal education     | 46                       | 49                       | 0.47   | .05 .291 |       |          |
| Written education    | 32                       | 30                       | 0.43   | .04 .304 |       |          |
| Referral             | 26                       | 29                       | 0.16   | .02 .408 |       |          |
| Assessment           | 38                       | 50                       | 2.52*  | .11 .043 |       |          |
| Country of Residence | Australia (%)            | Canada (%)               | UK (%) | USA (%)  |       |          |
| Verbal education     | 64                       | 35                       | 56     | 48       | 3.48* | .12 .040 |
| Written education    | 36                       | 29                       | 50     | 29       | 0.08  | .02 .575 |
| Referral             | 50                       | 29                       | 44     | 25       | 0.08  | .02 .507 |
| Assessment           | 64                       | 41                       | 44     | 45       | 0.91  | .06 .239 |

Education was dichotomized, such that for education, 0=received less than an associate degree and 1=received an associate degree or higher

\* $p < .05$  \*\* $p < .01$  \*\*\* $p < .001$

### Frequency of Mental Health Education, Assessments, and Referrals

Based on participant self-report, we found that physicians are more likely than physical therapists to assess mental health and refer for mental health treatment. One possible explanation is that physicians have exposure to psychiatry training in medical school. Studies demonstrate that primary care physicians (PCPs) frequently refer to specialty care given their general scope of practice, which is consistent with our results that PCPs were the most likely to assess mental health and provide a referral (Forest & Reid, 2001).

Medical clinicians might feel more comfortable screening and referring for mental health concerns with more robust vestibular disorder-specific mental health screening tools (e.g., depression and anxiety screeners for this population), and treatments adapted to this population (e.g., CBT and ACT for chronic dizziness). Recent progress includes multiple screening tools for this population including Patient Health Questionnaire Anxiety and Depression Scale (PHQ-ADS) and the Neuropsychological Vertigo Inventory (NVI; Herdman et al., 2022a, 2022b; Lacroix et al., 2016). Although application of current treatments like Cognitive Behavioral Therapy (CBT) and Acceptance and

Commitment Therapy (ACT) to patients with vestibular disorders is promising, more randomized controlled trials are needed.

### Mental Health Education, Assessments, and Referrals by Demographic and Disorder-Specific Variables

Our results indicate that men received written education more often than women; past research indicates that negative attitudes about mental health treatment among men make them less likely to seek treatment than women (Gonzalez et al., 2011). It is difficult to interpret our finding with confidence due to our small sample size of men compared to women.

Interpreting our findings cautiously, it is possible that men were more likely to receive written education due to gender biases by clinicians in favor of male patients or that clinicians feel less comfortable addressing mental health verbally with male patients due to increased stigma and thus prefer to provide information in writing (Chapman et al., 2013; Chatmon, 2020).

Patients who identified with experiencing symptoms “all the time” as opposed to “discrete episodes and returning to baseline” reported more verbal education,

**Table 5** Severity of mental health and disorder-specific symptom associations and moderation of provider interventions with current and past use of mental health services

| Predictor  | Current mental health services |      |    |                |        |       | Past mental health services |       |    |                |        |       |      |
|--|--------------------------------|------|----|----------------|--------|-------|-----------------------------|-------|----|----------------|--------|-------|------|
|  | B (SE)                         | Wald | df | Odds (Z-score) | 95% CI |       | B (SE)                      | Wald  | df | Odds (Z-score) | 95% CI |       |      |
|  |                                |      |    |                | Lower  | Upper |                             |       |    |                | Lower  | Upper |      |
| <b>Symptom Severity</b>  |                                |      |    |                |        |       |                             |       |    |                |        |       |      |
| Dizziness  | 0.02 (.01)                     | 3.49 | 1  | 1.34           | 0.99   | 1.79  | 0.01 (.01)                  | 1.21  | 1  | 1.27           | 0.94   | 1.73  | .272 |
| Depression   | 0.11 (.04)                     | 9.94 | 1  | 1.75**         | 1.27   | 2.41  | 0.12 (.04)                  | 10.42 | 1  | 1.88**         | 1.33   | 2.63  | <.01 |
| Anxiety  | 0.06 (.03)                     | 3.27 | 1  | 1.27           | 0.95   | 1.71  | 0.08 (.03)                  | 7.00  | 1  | 1.56**         | 1.14   | 2.15  | <.01 |
| <b>Moderation Analyses</b>   |                                |      |    |                |        |       |                             |       |    |                |        |       |      |
| Dizziness X Verbal education   | 0.01 (.01)                     | 1.30 | 1  | 1.27           | 0.91   | 1.80  | 0.01 (.01)                  | 3.80  | 1  | 1.47           | 1.02   | 2.15  | .051 |
| Dizziness X Written education  | -0.01 (.01)                    | 1.11 | 1  | 0.77           | 0.54   | 1.11  | -0.01 (.01)                 | 2.65  | 1  | 0.70           | 0.46   | 1.07  | .104 |
| Dizziness X Referral   | 0.01 (.01)                     | 3.66 | 1  | 1.49           | 1.03   | 2.16  | 0.02 (.01)                  | 7.84  | 1  | 2.01**         | 1.24   | 3.28  | <.01 |
| Dizziness X Assessment   | 0.00 (.01)                     | 0.05 | 1  | 1.09           | 0.76   | 1.55  | 0.00 (.01)                  | 0.24  | 1  | 1.11           | 0.76   | 1.64  | .623 |
| Depression X Verbal education  | 0.02 (.02)                     | 1.21 | 1  | 1.27           | 0.91   | 1.77  | 0.03 (.02)                  | 4.92  | 1  | 1.56*          | 1.09   | 2.24  | .027 |
| Depression X Written education   | -0.01 (.02)                    | 0.21 | 1  | 0.86           | 0.59   | 1.24  | -0.01 (.02)                 | 0.54  | 1  | 0.79           | 0.52   | 1.18  | .464 |
| Depression X Referral  | 0.03 (.02)                     | 2.50 | 1  | 1.47           | 1.02   | 2.12  | 0.06 (.02)                  | 7.08  | 1  | 1.85**         | 1.16   | 2.95  | <.01 |
| Depression X Assessment  | 0.01 (.02)                     | 0.11 | 1  | 1.11           | 0.79   | 1.57  | 0.01 (.02)                  | 0.09  | 1  | 1.21           | 0.84   | 1.73  | .760 |
| Anxiety X Verbal education   | 0.02 (.02)                     | 1.12 | 1  | 1.26           | 0.90   | 1.77  | 0.06 (.02)                  | 5.36  | 1  | 1.60*          | 1.11   | 2.34  | .021 |
| Anxiety X Written education  | -0.02 (.03)                    | 0.72 | 1  | 0.81           | 0.56   | 1.18  | -0.04 (.03)                 | 1.78  | 1  | 0.71           | 0.47   | 1.09  | .182 |
| Anxiety X Referral   | 0.04 (.03)                     | 3.10 | 1  | 1.48           | 1.02   | 2.16  | 0.08 (.03)                  | 5.84  | 1  | 1.84*          | 1.15   | 2.94  | .016 |
| Anxiety X Assessment   | 0.01 (.02)                     | 0.31 | 1  | 1.11           | 0.78   | 1.57  | 0.01 (.02)                  | 0.37  | 1  | 1.21           | 0.83   | 1.76  | .541 |
| <b>Dizziness symptoms measured by DHI</b>  |                                |      |    |                |        |       |                             |       |    |                |        |       |      |
| Depression symptoms measured by CES-D-10. Anxiety symptoms measured by GAD-7   |                                |      |    |                |        |       |                             |       |    |                |        |       |      |
| Referral = whether participant received a referral for mental health   |                                |      |    |                |        |       |                             |       |    |                |        |       |      |
| Assessment = whether participant was assessed for mental health symptoms   |                                |      |    |                |        |       |                             |       |    |                |        |       |      |
| Two separate dichotomous variables were calculated to assess whether a participant was currently receiving mental health services or received mental health services in the past whereby 0 = not currently receiving any form of mental health treatment or did not receive therapy in the past and 1 = at least one form of current mental health treatment was reported or at least one form of mental health treatment was reported in the past |                                |      |    |                |        |       |                             |       |    |                |        |       |      |

\* $p < .05$  \*\* $p < .01$  \*\*\* $p < .001$

assessment, and referral compared with those who identified symptoms that come and go. This is consistent with increased prevalence of anxiety, depression, and panic disorder (compared to the general population) in conditions such as vestibular migraine, Meniere's Disease, and persistent postural perceptual dizziness, but not in conditions such as benign paroxysmal positional vertigo and vestibular neuritis (Eckhardt-Henn et al., 2008; Staab, 2012).

### **Severity of Mental Health and Disorder-Specific Symptom Associations with Mental Health Education, Assessments, and Referrals**

Previous studies have demonstrated that the majority of people who experience mental health concerns do not seek treatment due to factors such as stigma, gender identity, race, education, and income; however, mental health treatment seeking has not been studied in the context of patients with vestibular disorders (Miller-Matero et al., 2018; Wang et al., 2005; Clement et al., 2015; Conner et al., 2010). The current sample of patients with vestibular disorders was largely comprised of White, educated, females; in individuals with these demographic variables without vestibular disorders, higher levels of anxiety and depression typically predict seeking mental health treatment. This was consistent with the current sample with vestibular disorders. While our data do not address why current depression and anxiety symptoms are related to treatment seeking prior to completion of this study's questionnaires, but after initial vestibular disorder diagnosis (i.e., "past treatment"), it's reasonable to hypothesize that anxiety and depression take a more chronic course when associated with comorbid chronic medical conditions such as vestibular disorders.

Beyond symptom severity impacting mental health treatment-seeking, results indicate that participants who had received verbal education and/or a mental health referral were more likely to have sought mental health treatment. This demonstrates the importance of facilitating mental health education and referral. Past and not current mental health treatment-seeking might be explained by the COVID-19 pandemic, during which the CDC documented 41% of patients delaying or avoiding medical care (Czeisler et al., 2020). Further, the current study did not examine repeated clinician education or referral reminders, which may make a patient more likely to engage with mental health services.

### **Limitations**

The present study has multiple limitations, largely from the convenience sampling strategy via social media. The resulting sample likely represents a subpopulation of the

vestibular community given that older adults are more likely to experience vestibular dysfunction and are less likely to use social media (Agrawal et al., 2013; Anderson & Perrin, 2017). However, our sample had double the prevalence of VM compared to any other vestibular disorder (20.4% VM vs. the next most prevalent, PPPD at 9.7%), and this parallels known clinical presentations of VM patients. A very large epidemiological study on the 2008 National Health Interview Survey found female preponderance (64.1% for VM vs. 51.7% for all vestibular disorders) as well as a younger age (40.9 years for VM vs. 46 years for all vestibular disorders; Vanstrum et al., 2022). According to Staab in 2020, there are no known large epidemiological studies on the incidence or prevalence of PPPD (Staab, 2020). Our largely White sample also likely underrepresents the diversity of patients experiencing vestibular disorders given that Agrawal and colleagues found no differences in vestibular dysfunction between White, African-American, and Mexican American patients (2009).

Our sampling method allowed us to explore patient experience with a wide range of vestibular clinicians; a sample with greater generalizability to those with vestibular disorders and more diagnostic precision would have required surveying patients in a small number of vestibular clinics, which would not provide a meaningful overview of vestibular clinicians at large. Rather, this type of sampling would only demonstrate how a small number of vestibular clinicians incorporate mental health into their practice, which does not provide meaningful information for the necessity of clinician training as a whole.

Furthermore, it is possible that this anonymous survey was shared with others outside of the targeted social media communities. Our method of survey dissemination also prevented the calculation of a response rate and identification of response bias. Moreover, we relied on self-report and therefore cannot determine medical accuracy of reported diagnoses and is subject to recall bias.

Despite study limitations, results suggest that mental health is an under-utilized clinical target. The results merit further attention to training clinicians in how to educate and refer their patients to mental health education, and the need for integrated care when treating vestibular disorders. Because this study is exploratory in nature, it is important for future studies to replicate these data as well as attempt to capture the experience of the vestibular community at large, to include those who do not participate in social media. Moreover, we did not survey medical professionals because this study focuses on the patient experience, but clinician reports in the future will be essential to gain a deeper understanding of the full clinician-patient experience as it relates to mental health education and referral and subsequent treatment-seeking by patients.

## Future Directions

Other chronic health conditions can be used as a parallel to vestibular disorders to highlight directions for future research and clinical intervention. Chronic pain is analogous to vestibular disorders in many ways: both conditions can cause debilitating symptoms with unpredictable exacerbations. Similar to vestibular disorders, chronic pain also has a well-documented negative impact on mental health (Hooten, 2016).

Chronic pain has likely received more research attention than vestibular disorders due to prevalence. The CDC estimates about 50 million Americans suffer from chronic pain whereas the 2008 US National Health Interview Survey estimated 33 million Americans live with dizziness and balance issues (Dahlhamer et al., 2018; Kerber et al., 2017). Moving forward, cutting edge treatment of chronic pain provides a solid template for treating vestibular disorders. With chronic pain multidisciplinary treatment as a template, vestibular disorder treatment might include the following: training vestibular specialist clinicians in screening patient mental health, providing mental health education, and referring appropriately.

## Conclusion

In conclusion, the majority of patients with self-reported vestibular diagnoses indicated that their medical providers have not educated them about mental health, assessed their mental health, or provided mental health referrals. This is an important area of education for medical professionals to improve outcomes for patients living with vestibular disorders.

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**Author contributions** Emily O. Kostelnik, PhD: Designed the study; communicated with Facebook Group Administrators for posting survey information; created survey; consulted on statistical procedure; wrote Introduction and Discussion; provided detailed edits on the manuscript; and scheduled and ran research meetings for the group. Lindsay M. Howard, PhD: Consulted on study design and survey content; exported the data, cleaned data, ran statistical analyses; wrote Methods and Results; created all tables; and provided detailed edits on the manuscript. James F. Paulson, PhD: Consulted on study design and survey content; provided guidance on statistical analyses and proper interpretation; and provided detailed edits on the tables and manuscript as a whole.

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**Data Availability** Available upon request.

**Code Availability** Not applicable.

## Declarations

**Conflict of interest** The Emily O. Kostelnik operates a business that provides virtual behavioral health education for individuals with vestibular disorders. The business sells virtual courses and provides free education via social media; it is not a private psychology practice. The business' social media pages were used as one of several means to recruit participants.

**Ethical Approval** This study qualified for exemption by the institutional review board at Old Dominion University (1840983).

**Consent to Participant** Participants read an informed consent document and virtually consented to participate prior to completing the questionnaires.

**Consent for Publication** Authors consent to publication.

**Human and Animal Rights and Informed Consent** This study was approved by an Institutional Review Board and participants completed online informed consent prior to participation.

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