Psychological distress longitudinally mediates the effect of vertigo symptoms on vertigo-related handicap

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ABSTRACT

Objective: Vertigo symptoms can lead to more or less vertigo-related handicap. This longitudinal study investigated whether depression, anxiety, and/or somatization mediate the relationship between vertigo symptoms and vertigo-related handicap.

Methods: $N = 111$ patients with vertigo/dizziness provided complete data on the following measures: Vertigo symptoms at baseline, depression at 6-month follow-up, anxiety at 6-month follow-up, somatization at 6-month follow-up, and vertigo handicap at 12-month follow-up. Mediation analyses with bootstrapping were performed to investigate the mediating role of anxiety, depression, and somatization in the relationship between vertigo symptoms and vertigo-related handicap.

Results: When the mediating role of anxiety, depression, and somatization was evaluated separately from each other in single mediation models, the effect vertigo symptoms at baseline exerted on vertigo-related handicap at 12-month follow-up was significantly mediated by depression at 6-month follow-up ($p < 0.05$), by anxiety at 6-month follow-up ($p < 0.05$), as well as by somatization at 6-month follow-up ($p < 0.05$). When statistically controlling for the other mediators in a multiple mediator model, only depression at 6-month follow-up mediated the effect of vertigo symptoms at baseline on vertigo-related handicap at 12-month follow-up ($p < 0.05$).

Conclusion: Psychological distress is an important mechanism in the process how vertigo symptoms lead to vertigo-related handicap.

1. Introduction

Vertigo and dizziness are interconnected body-related symptoms that affect between 20% and 56% of the general population (e.g., [4,25,49]). They are among the most common symptoms in primary care (e.g., [17,23,45]) and are associated with disabilities/handicap in daily life [20,52,57]. However, the severity of vertigo symptoms was only moderately correlated with the degree of vertigo-related handicap in previous studies (e.g., [12,52,56]). This implies that not all patients suffering from symptoms develop handicap. In order to prevent patients from being handicapped by the symptoms, it is essential to know the mechanisms underlying the process how symptoms lead to handicap. To explore such mechanisms, mediation analysis appears to be a promising approach, since a mediator is a variable that contributes to the relationship between one variable X and another variable Y. Psychological distress might be a relevant mediator between vertigo symptoms and vertigo-related handicap, because psychological distress related to anxiety, depression, and somatization is frequently associated with symptoms of vertigo as well as with vertigo-related handicap (e.g., [3,9,29,31,40,47,54–56]).

Psychological distress can result from the experience of vertigo/dizziness symptoms. Staab [46] described a shift in attentional strategies after an acute stage of vertigo including heightened vigilance to

environmental factors in order to reduce risks as well as increased checking and monitoring of bodily sensations related to dizziness. Such a distorted awareness of somatic sensory stimuli (*somatosensory amplification*; [2]) might contribute to the links between vertigo/dizziness and (a) somatoform disorders [3,31] as well as (b) anxiety disorders [1,10,11,21,22]. Supporting this line of argumentation, alarming body- and panic-related thoughts after (but not at the acute stage of) vestibular neuritis predicted the subsequent development of panic and somatoform disorders [14]. In related work, Godemann and colleagues reported that anxiety, catastrophic thoughts, and dependent personality traits (but not sub-clinical organic changes) account for the persistence of (chronic) vertigo/dizziness symptoms after vestibular neuritis [13,15]. Protective psychological factors such as resilience and sense of coherence, however, minimized the chance to suffer from (functional/psychiatric) vertigo/dizziness symptoms 1-year after (structural/metabolic) vestibular diseases [50]. In another 1-year follow-up study, Nakao and Yano [37] showed that dizziness at baseline significantly predicts depressive disorders during the following year. A further study reported that new depressive and anxiety disorders are triggered by neurotologic conditions in 33% of the patients [48]. Although psychological distress has been found to be more prevalent after than before vertigo/dizziness [8], psychological distress can also cause vertigo/dizziness. Kroenke et al. [24] reported that psychiatric disorders are the primary cause of vertigo/dizziness in 16% of the patients. Staab and Ruckenstein [48] found that anxiety (in 33% of the cases), but not depression can cause vertigo/dizziness.

Despite the relevance of anxiety, depression, and somatization in vertigo/dizziness patients, their specific contributions to the process how vertigo symptoms lead to vertigo-related handicap remain unclear. Only a recent 12-month follow-up study found anxiety and pain as mediators between dizziness and falls (one specific vertigo-related handicap) in older people [35]. Therefore, the current study investigated whether psychological distress related to depression, anxiety, and somatization longitudinally mediates the symptom-handicap link by evaluating the follow-ups of a large study with patients of a treatment center specialized in vertigo/dizziness [28,29]. The hypotheses were that anxiety is a significant mediator because this was the case in the above-mentioned study with elderly patients [35] and also that depression is a significant mediator because this was found in studies in the area of pain [30]. No specific hypothesis was made regarding somatization, because no study was found that investigated somatization as a mediator between symptom severity and handicap.

2. Methods

2.1. Study design

Patients with vertigo/dizziness were assessed at three assessment points in this naturalistic study: t0 = baseline, t1 = 6-month follow-up, and t2 = 12-month follow-up. The study was approved by the Ethics Committee of the University of Munich. See Lahmann et al. [28] for a detailed description of the study design. The delivery of a specific treatment was not part of this study, but the patients were allowed to start/stop any treatment during the study period.

2.2. Patients

Patients were recruited at a Center for Vertigo and Balance Disorders at the University Hospital Munich, Campus Großhadern, Germany between May 2010 and June 2012. Patients were excluded when they either were younger than 18 years, or had no sufficient knowledge in German, or suffered from a neurodegenerative disorder. $N = 860$ patients were eligible and $n = 687$ patients gave informed consent to partake in the study. For the present study, only those patients were analyzed with complete data on the following questionnaires: Vertigo Symptom Scale (VSS) at t0, Beck Depression Inventory (BDI-II) at t1,

Beck Anxiety Inventory (BAI) at t1, Patient Health Questionnaire (PHQ-15) at t1, Vertigo Handicap Questionnaire (VHQ) at t2. $N = 111$ patients fulfilled this inclusion criteria. The comparison between the included and excluded patients is given below. Only a few of these patients were in mental health treatments at the assessment points: $n = 13$ patients received outpatient psychotherapy at t0, $n = 6$ outpatient psychiatric treatment at t0, $n = 24$ outpatient psychotherapy at t1, $n = 8$ outpatient psychiatric treatment at t1, $n = 19$ outpatient psychotherapy at t2, and $n = 8$ outpatient psychiatric treatment at t2. Regarding the vertigo diagnoses, $n = 68$ patients (61.3% of $N = 111$) had a structural/metabolic vertigo and $n = 43$ patients (38.7% of $N = 111$) suffered from functional/psychiatric vertigo. The vertigo diagnoses were made after a neurological assessment, which is described below. For the sample of the study at hand, this neurological assessment resulted in the following more specific vertigo diagnoses (a patient could have more than one diagnosis): $n = 21$ (18.9%) Meniere's disease; $n = 19$ (17.1%) benign paroxysmal positional vertigo, $n = 18$ (16.2%) vestibular migraine, $n = 9$ (8.1%) bilateral vestibulopathy, $n = 8$ (7.2%) vestibular neuritis, $n = 6$ (5.4%) vestibular paroxysmia, $n = 6$ (5.4%) central vertigo, and $n = 3$ (2.7%) multisensory deficit.

2.3. Neurological assessment

Medical experts performed a complete neurological, neuro-otological, and neuro-ophthalmological examination of all patients including measurements of the subjective visual vertical and ocular torsion for vestibular testing as well as video-oculography with caloric irrigation. The diagnoses were based upon the results of testing and the established diagnostic criteria for the different vestibular disorders [7]. The diagnosis of vestibular migraine was based on the criteria of Neuhauser, Lempert, and colleagues [38,39,43], Meniere's disease was diagnosed corresponding to the diagnostic criteria of the American Academy of Otolaryngology, Head and Neck Surgery [6], and the diagnosis of vestibular paroxysmia was based on the criteria of Brandt and Dieterich [5]. Patients were diagnosed as having functional/psychiatric symptoms in case no structural dysfunction explaining the symptoms was found.

2.4. Questionnaires

Vertigo Symptom Scale (VSS; German version: [51]). The VSS consists of 34 items. In the present study, the VSS sum score was analyzed. The German VSS is a reliable and valid measure of vertigo symptoms [12,51]. For the $N = 111$ patients of the present study, Cronbach's Alpha of the VSS at t0 (independent variable for the mediation analyses) was $\alpha = 0.90$.

Vertigo Handicap Questionnaire (VHQ; German version: [52]). The VHQ comprises 25 items to measure vertigo-related handicap in different domains. The global score of the VHQ was analyzed in the study at hand. The global score of the German VHQ can be used to reliably and validly measure vertigo-related handicap [52]. The VHQ at t2 (outcome variable for the mediation analyses) reached a Cronbach's Alpha of $\alpha = 0.95$ in our sample of $N = 111$ patients.

Beck Depression Inventory – second edition (BDI-II; German version: [18]). The BDI-II has 21 items and the BDI-II sum score was analyzed in the current study as a measure of depression. Research supported the reliability and validity of the German BDI-II [27]. For the $N = 111$ patients analyzed in the study at hand, Cronbach's Alpha of the BDI-II at t1 (mediator variable for the mediation analyses) amounted to $\alpha = 0.92$.

Beck Anxiety Inventory (BAI; German version: [32]). The 21 items of the BAI measure the severity of anxiety symptoms. In the study at hand, the BAI global score was analyzed. The BAI is a psychometrically sound instrument suited to assess anxiety [32]. The reliability (Cronbach's Alpha) of the BAI at t1 (mediator variable for the mediation analyses) reached $\alpha = 0.91$ for the sample ($N = 111$) of the present study.