J Neurol (2011) 258:104–112
DOI 10.1007/s00415-010-5697-y

ORIGINAL COMMUNICATION

Patients' psychological well-being and resilient coping protect from secondary somatoform vertigo and dizziness (SVD) 1 year after vestibular disease

Regine Tschan · Christoph Best · Manfred E. Beutel · Achim Knebel · Jörg Wiltink · Marianne Dieterich · Annegret Eckhardt-Henn

Received: 23 April 2010 / Revised: 24 July 2010 / Accepted: 30 July 2010 / Published online: 18 August 2010

Abstract Secondary somatoform dizziness and vertigo (SVD) is an underdiagnosed and handicapping psychosomatic disorder, leading to extensive utilization of health care and maladaptive coping. Few long-term follow-up studies have focused on the assessment of risk factors and little is known about protective factors. The aim of this 1-year follow-up study was to identify neurootological patients at risk for the development of secondary SVD with respect to individual psychopathological disposition, subjective well-being and resilient coping. In a prospective interdisciplinary study, we assessed mental disorders in $n = 59$ patients with peripheral and central vestibular disorders ($n = 15$ benign paroxysmal positional vertigo, $n = 15$ vestibular neuritis, $n = 8$ Menière's disease, $n = 24$ vestibular migraine) at baseline (T0) and 1 year after admission (T1). Psychosomatic examinations included the structured clinical interview for DSM-IV, the Vertigo Symptom Scale (VSS), and a psychometric test battery measuring resilience (RS), sense of coherence (SOC), and satisfaction with life (SWLS). Subjective well-being significantly predicted the development of secondary SVD: Patients with higher scores of RS, SOC, and SWLS at T0 were less likely to acquire secondary SVD at T1. Lifetime mental disorders correlated with a reduced subjective well-being at T0. Patients with mental comorbidity at T0 were generally more at risk for developing secondary SVD at T1. Patients' dispositional psychopathology and subjective well-being play a major predictive role for the long-term prognosis of dizziness and vertigo. To prevent secondary SVD, patients should be screened for risk and preventive factors, and offered psychotherapeutic treatment in case of insufficient coping capacity.

Keywords Vertigo · Somatoform dizziness · Resilience · Sense of coherence · Quality of life · Coping

R. Tschan (✉) · M. E. Beutel · A. Knebel · J. Wiltink
Clinic of Psychosomatic Medicine and Psychotherapy, University Medical Center of the Johannes Gutenberg University Mainz, Untere Zahlbacher Str. 8, 55131 Mainz, Germany
e-mail: tschan@psychosomatik.klinik.uni-mainz.de

C. Best
Department of Neurology, University Medical Center of the Johannes Gutenberg University, Mainz, Germany

M. Dieterich
Department of Neurology, Ludwig-Maximilians-University, Munich, Germany

A. Eckhardt-Henn
Department of Psychosomatic Medicine, Bürgerhospital, Stuttgart, Germany

Introduction

Patients with acute vestibular diseases are prone to develop secondary somatoform vertigo and dizziness (SVD) as a consequence of insufficient disease-specific interdisciplinary treatment attending to maladaptive coping and psychiatric comorbidity. An average of 37.5% of vestibular vertigo syndromes carry a risk of psychiatric or psychosomatic disorders such as anxiety (14%), somatoform disorders (15%), and depression (9%) [13]. The prognosis may be poor in case of severe relapsing vertigo attacks with maladaptive coping [31, 38, 44, 48]. A 1-year follow-up study on vestibular neuritis, for example, revealed the persistence of anxiety-related symptoms in one-third of the patients [21]. Morbus Menière patients reported recurrent vertigo attacks with diffuse lightheadedness and uncertainness over years; their subjective well-being and quality

of life was significantly reduced [8, 33, 36]. Benign paroxysmal positional vertigo led to psychosocial distress and repeated medical attendance [25, 30, 42]. Patients with vestibular migraine showed the poorest health outcome in comparison to different vestibular subgroups; they reported most frequently handicapped activity, anxiety, and depression [4, 7, 12].

Etiologically, a specific causal linkage between vestibular neuronal pathways and the emotion processing system has been postulated [2, 18, 32]. Unspecific etiological models hypothesized various risk factors for mental comorbidity: (a) the phenomenology of the underlying neurootological disease, (b) premorbid anxiety handling and dispositional psychopathology, and (c) catastrophizing cognitive appraisal, concomitant autonomic arousal, and avoidance behavior [3, 4, 30, 36–38, 47, 48].

Although many cross-sectional studies focused on the assessment of symptom severity and dizziness-specific handicaps, only a handful of prospective long-term studies explored predictive factors in persisting vertigo and dizziness [4, 21, 25]. Godemann et al. [21] identified 'body-related anxiety' and 'anxiety-related apprehension' as crucial factors for ongoing dizziness 1 year after the onset of vestibular neuritis. In interaction with the 'illness-severity' of the initial vertigo attacks, 'fear of body sensations' was a relevant predictor of secondary SVD 3 month after a peripheral vestibular disorder [25]. In our own prospective study of subgroups with vestibular vertigo syndromes, persistence of symptoms was positively correlated with lifetime mental disorders, subjective symptom severity and handicap, but not with the objectively documented vestibular deficits in neurootological testing [4].

Beside these specific risk factors, little is known about preventive factors for mental comorbidity, and subsequently for the development of secondary SVD. To date, protective factors like coping capacity, subjective well-being or quality of life have been investigated insufficiently for the subgroup of vestibular diseases. Resiliency and sense of coherence are two well established general components of effective coping [1, 16, 17, 28, 34, 35, 39]. Resiliency is defined as the ability to cope successfully with life change or misfortune. Resilient individuals quickly regain their balance, keep going despite adversity, and perceive change as a challenging necessity [28, 34, 43]. Coherence denotes a dispositional orientation, which facilitates the avoidance or combat of a wide variety of stressors, thereby enhancing health. It is the subjective perception that enables people to manage tension and stressful stimuli, to reflect about their external and internal resources, to identify and mobilize them, and to cope effectively by finding solutions in a health promoting manner. These concepts conceive stressors as being motivationally meaningful or even welcomed challenges that are worth investing and engaging oneself in [1, 16, 17, 39].

The purpose of this prospective study is to identify protective factors of subjective well-being (resiliency, sense of coherence, subjective quality of life) and risk factors (lifetime mental disorders, comorbid mental disorders, stressful life events) that predict the development of secondary SVD 1 year after admission. The study is based on a well-defined sample of consecutive patients with vestibular vertigo syndromes including benign paroxysmal positional vertigo, vestibular neuritis, Menière's disease, and vestibular migraine. Over the course of 1 year, only dizziness patients whose vestibular deficit or dysfunction was centrally compensated were diagnosed for secondary SVD. This is the first study, which explores the predictive value of protective factors next to risk factors in the context of vertigo and dizziness.

Patients and methods

In an interdisciplinary prospective study, we examined a total of 59 vestibular vertigo patients with respect to the development of secondary SVD over the course of 1 year. Vestibular vertigo syndromes due to benign paroxysmal positioning vertigo (BPPV, $n = 15$), vestibular neuritis (VN, $n = 12$), vestibular migraine (VM, $n = 24$), or Menière's disease (MD, $n = 8$) were recruited. The sample included 24 women and 35 men; the average age for women was 51 ($\pm$13), for men 53 ($\pm$13), and for the entire group 52 ($\pm$13) years. To ensure the long-term study of acute vestibular diseases, only patients with recent attacks (VN: within 7 days after symptom onset; VM, BPPV, MD: initial attack had to be within the last 6 months) were included. Patients with vertigo and dizziness lasting longer than 6 months were excluded in order to minimize psychological effects of chronicity. All patients gave their written, informed consent. The study was performed according to the criteria of the Declaration of Helsinki and was approved by the local ethics committee. All patients underwent detailed diagnostic procedures in the Departments of Neurology and Psychosomatic Medicine and Psychotherapy at baseline, 6-weeks follow-up, 12-weeks follow-up, 6-month follow-up, and 1-year follow-up.

Neurological examination

Neurological examination consisted of neuro-orthoptic analysis, and neurophysiological vestibular laboratory testing including an electro-oculography with caloric irrigation according to the criteria of Honrubia [26], measurements of the subjective visual vertical (SVV), and ocular torsion (OT) by fundus photographs. Measurements of the SVV and OT were transformed in a standardized manner [11]. Bithermal caloric irrigation was performed to

determine any asymmetry on caloric nystagmus using the formula of Jongkees (pathological side difference >25%). Detailed results of the neurootological examination were published elsewhere [4].

Psychometric examination

Structured Clinical Interview

To achieve high objectivity in the diagnostic screening for mental disorders, we used the structured clinical interview (SCID) for DSM-IV Axis I (state mental comorbidities), Axis II (personality disorders) and Axis IV (stressful life events) [45]. Besides evaluating the diagnostic criteria of the DSM-IV, it is possible to assess several time sequences such as recurrent episodes and lifetime occurrence of the different disorders. Thus, the SCID is able to weight the chronology of mental disorders, symptom onset, progression, duration, frequency, and number of symptoms and attacks.

The differentiation into the three dichotomous variables (a) lifetime mental disorders (yes/no), (b) comorbid mental disorders (yes/no), and (c) stressful life events (yes/no) were based on the SCID. To examine their predictive value, only the SCID results from T0 were used.

Comparisons between the baseline and the 3-year follow-up appointments were made by the following questionnaires:

Vertigo symptom scale

Vertigo and dizziness-related symptoms were assessed by the German version of the Vertigo Symptom Scale (VSS) [41]. This questionnaire consists of 34 items measuring symptom severity and quality of dizziness (vertigo, imbalance, diffuse dizziness, or lightheadedness), autonomic symptomatology and signs of anxiety arousal, panic, hyperventilation and somatization. Two main subscales can be derived from the VSS, 'vertigo and related symptoms' (VSS-VER) examines symptoms of dysfunction in the balance system, whereas 'somatic anxiety and autonomic arousal' (VSS-AA) assesses accompanying anxiety-related symptoms. As unit of measurement the average scores of the two scales are calculated. VSS-VER and VSS-AA have good internal consistencies (Cronbach's alpha: VER 0.79; AA 0.89) [41, 46].

Diagnostic classification of secondary SVD

Dizziness patients were classified into one of four groups depending on the (non-) existence of vestibular deficit or dysfunction and the (non-) existence of mental comorbidity at 1 year after admission (T1). Diagnostic criteria for secondary SVD were defined in advance based on the literature [14, 15]:

(1) A vestibular deficit or dysfunction, both at 6-month and at 1-year follow-up not centrally compensated, without mental comorbidity was assigned to the subgroup of 'vestibular vertigo syndromes'.
(2) An initial vestibular deficit or dysfunction, both at 6-month and at 1-year follow-up centrally compensated, but with long-term mental comorbidity was assigned to the subgroup of secondary 'SVD'. Vertigo or dizziness had to be the chief complaint and the equivalent or correlate of the underlying mental disorder.
(3) Vertigo or dizziness without any vestibular deficit or dysfunction nor concomitantly mental disorders was classified as 'unknown etiology'.
(4) An initial vestibular deficit or dysfunction, both at 6-month and at 1-year follow-up centrally compensated, without long-term persisting vertigo or dizziness, was assigned to the subgroup of 'normal recovery'.

Resilience Scale

The 25-item Resilience Scale (RS) is a self-reported measurement of the degree of individual resilience, which is considered a positive personality characteristic enhancing successful adaptation. All items are scored on a 7-point Likert-type scale from 1 = disagree, to 7 = agree. A sum score ranges from 25 to 175 with higher scores indicating higher perceived resilience [34, 43]. Good psychometric properties for reliability (internal consistency; Cronbach's alpha: 0.95) and validity of the German version were elaborated [34].

Coherence scale

The Sense of Coherence Scale (SOC) is a 29-item scale, which measures three components: comprehensibility (11 items), manageability (10 items), and meaningfulness (8 items). Responses are given on a 7-point Likert-type scale from 1 = disagree, to 7 = agree. 12 items have to be reversed. The sum score ranges from 29 to 203 with higher scores indicating higher perceived sense of coherence [1, 35]. The SOC, defined as a dispositional orientation, facilitates avoiding or combating a wide variety of stressors and therefore presumed to engender and enhance health. The concept induces stressors as being motivationally meaningful welcome challenges that are worth investing oneself in and engaging with [1]. Good psychometric properties for reliability (internal consistency; Cronbach's alpha: 0.95) and validity of the German version were reported [35].

Satisfaction with life scale

The satisfaction with life scale (SWLS) is a short, five-item self-reported instrument measuring judgments of one's life [9]. The scale was constructed as an assessment of subjective well-being [10]. All items are scored on a seven-point Likert-type scale from 1 = strongly disagree, to 7 = strongly agree. A sum score between 31 and 35 indicates an 'extremely satisfied' judgment of the own life, scores between 21 and 30 a 'satisfied' judgment, scores until 20 a 'neutral', and scores under 20 'dissatisfaction' with life. Good psychometric properties for reliability and validity of the German version were elaborated [9].

Statistical analyses

Statistical analyses were performed with SPSS (Statistical Package of the Social Sciences, Version 17) and LISREL (Linear Structural Relations, Version 8.72) [27]. The statistical relations between the dichotomous variables of dispositional psychopathology (lifetime mental disorders, comorbid mental disorders, and stressful life events) and the two interesting subgroups (secondary SVD vs. normal recovery) were computed by nonparametric procedures (Chi-Square-test, Fisher's exact test). Pearson's correlations verified the association between subjective well-being (RS, SOC, SWLS) and dizziness-specific anxiety (VSS-AA). The statistical relations between the normal distributed variables of subjective well-being (RS, SOC, SWLS) and the two subgroups (secondary SVD vs. normal recovery) were examined by parametric *T* tests. We defined the level of significance at $p < 0.05$; we additionally report larger effects ($p < 0.01$, $p < 0.001$). Because of the exploratory character of the study we did not perform alpha-adjustment. For the indication of effect size we calculated the value of Cohen's *d*.

Development of the encompassing SEM model

The associations within the encompassing SEM model were based on prior analyses [4–6, 40] and modified with two criteria in mind: first, that there is clear evidence in the literature to support associations between these variables, and second, that these relationships are defensible from a theoretical, 'causal' standpoint. We have selected variables for which there is some evidence in the literature [4–6, 24, 28]; however, there might be others that can be incorporated depending on new emerging evidence. SEMs are primarily representations of 'causal' relationships between hypothesized constructs, rather than just simple associations between those constructs. The advantage of this procedure is the simultaneous analyses of all major constructs described in this paper and their impact on the development of secondary SVD [22].

Best et al. [4, 6] found an exceptionally high rate of both previous and comorbid mental disorders in patients with secondary SVD. The authors postulated mental comorbidity as indication of a reactivated maladaptive coping style and therefore as a manifestation of the preexisting mental illness. Consequently, a positive history of psychiatric disorders was hypothesized as a major predictor for the development of secondary SVD [4]. In a recent study, simple logistic regression analyses showed preexisting mental disorders as a significant predictor for secondary SVD, accounting for 23.1% of the variance. The sense of coherence, was the strongest predictor for a normal recovery of vestibular vertigo, explaining 40.1% of the variance [40]. Other researchers proved a negative correlation between pre-existing mental illness and subjective well-being [24, 28]. One-way ANOVAs showed lifetime mental disorders negatively associated with coherency and resiliency. The analyses further disclosed an interaction between the number of stressful life events and the development of mental disorders [40].

In the current data, the variables *resiliency*, *sense of coherence*, and *satisfaction with life* were highly inter-correlated, encouraging the derivation of a common factor, labeled *subjective well-being*. This procedure was not applicable for the variables *lifetime mental disorders*, *mental comorbidity*, and *stressful life events*, which were kept as single predictors resulting in a hybrid model, combining latent and manifest variables on the structural level. Drawing on the above-mentioned analyses and references, we defined our base SEM model, starting with direct associations from *subjective well-being* and all variables reflecting different aspects of psychopathology on secondary SVD. As there was confirmable evidence in the literature [24, 28, 40], we added one association between *lifetime mental disorders* and *subjective well-being*, and one between *stressful life-events* and *mental comorbidity* to the model. As long as the model-fit didn't decline significantly, we deleted not significant pathways. This procedure resulted in the final model (depicted in Fig. 3), with no direct effects of *stressful life events* and *lifetime mental disorders* on the development of secondary SVD, both failing to reach statistical significance. Nevertheless, they had an impact on secondary SVD, mediated by their associations with *subjective well-being* and *mental comorbidity*.

Results

Diagnostic classification

One year after admission (T1), $n = 27$ (45%) patients showed a normal recovery. $n = 25$ (43%) patients suffered

from secondary SVD with the following mental comorbidities: (a) $n = 8$ (32%) anxiety disorders (ICD-10: F40, F41), (b) $n = 12$ (48%) depressive disorders (ICD-10: F32, F33, F34.1), and (c) $n = 5$ (20%) somatoform disorders (ICD-10: F45). For the initially defined vestibular subgroups, secondary SVD was distributed as follows: (a) $n = 2$ (17%) patients with VN and $n = 3$ (37.5%) patients with MD developed secondary SVD with a comorbid anxiety disorder; (b) $n = 6$ (40%) patients with BBPV developed secondary SVD with a comorbid depressive or anxiety disorder; and (c) $n = 14$ (58.5%) of the patients with VM exhibited secondary SVD with a depressive, anxiety or somatoform disorder. $n = 7$ (12%) patients of the total sample, who did not fit the main analytic categories, showed a relapsing vestibular vertigo syndrome at 1-year follow-up. They were excluded from the analysis.

Psychopathologic risk factors

Compared to patients with a normal recovery, patients with secondary SVD at T1 showed significantly more (a) lifetime mental disorders [$\chi^2(1) = 9.51$, $p < 0.05$], (b) mental comorbidity [$\chi^2(1) = 4.95$, $p < 0.05$], and (c) stressful life events [$\chi^2(1) = 6.03$, $p < 0.05$] at the onset of vestibular dysfunction (T0) (Fig. 1).

Protective factors of subjective well-being

Pearson correlations between subjective well-being (RS, SOC, SWLS) and dizziness-specific anxiety (VSS-AA) indicated less 'somatic anxiety and autonomic arousal' at T0, the higher RS ($r = -0.46$, $p < 0.05$), SOC ($r = -0.61$, $p < 0.05$), and SWLS ($r = -0.59$, $p < 0.05$) at T0 in the total sample were. Patients with lifetime mental disorders at T0 showed higher levels of VSS-AA at T0 than patients without lifetime mental disorders [$F(1) = 4.69$, $p < 0.05$; $d = 6.35$]. Mental comorbidity and stressful life-events at T0 had no influence on the extent of VSS-AA at T0. Patients with a normal recovery at T1 had significantly higher scores on RS [$T(50) = 3.75$, $p < 0.01$; $d = 1.03$], SOC [$T(38{,}089) = 4.50$, $p < 0.01$; $d = 1.27$], and SWLS [$T(37{,}644) = 4.31$, $p < 0.01$; $d = 1.22$] at T0 than patients with secondary SVD at T1 (Fig. 2).

Predictive factors for secondary SVD versus normal recovery

Subjective well-being (SOC, RS, SWLS) at T0 displayed a significant predictive value for the development of secondary SVD at T1. Patients with lifetime mental disorders showed significantly lower levels of subjective well-being at T0. Patients with mental comorbidity at the onset of the vestibular disease (T0) were at higher risk for secondary SVD at T1.

Figure 3 indicated that both subjective well-being (T0) and mental comorbidity (T0) explained a total of 33% (= R^2) of the variance of secondary SVD at T1. These

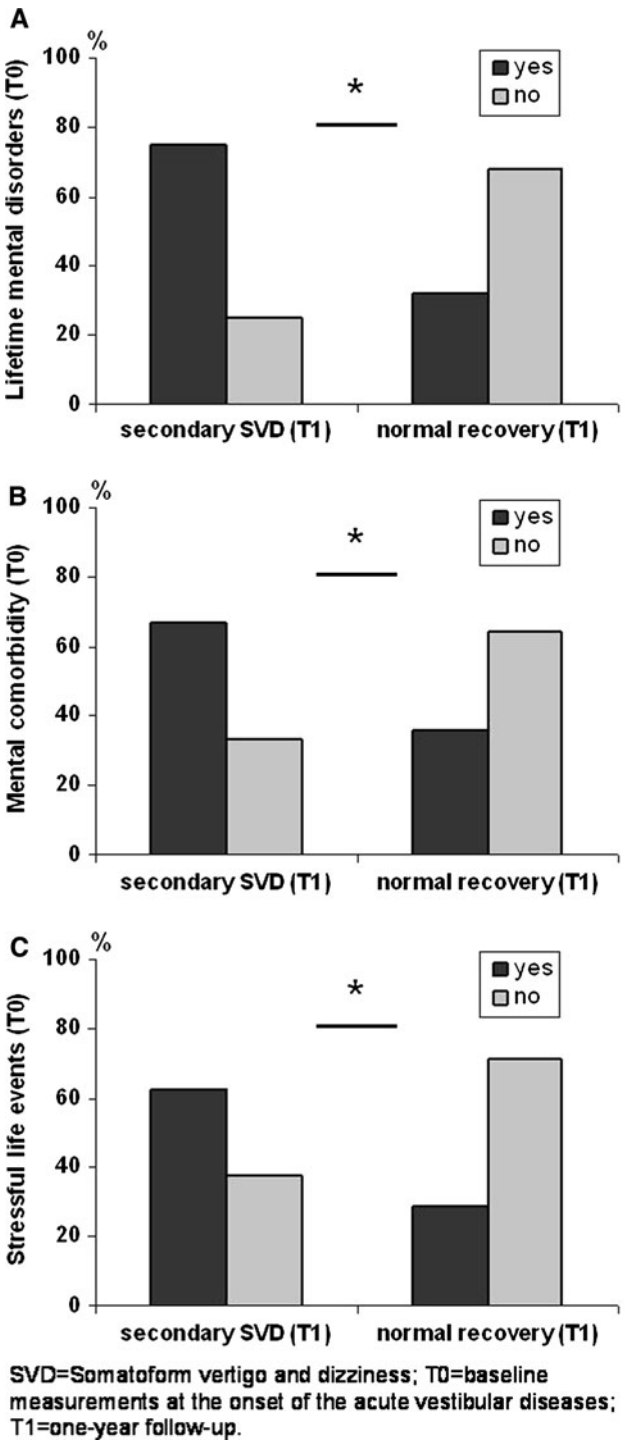

Fig. 1 Discrimination of patients with secondary SVD ($n = 25$) and patients with normal recovery ($n = 27$) by lifetime mental disorders, mental comorbidity, and stressful life events in the SCID

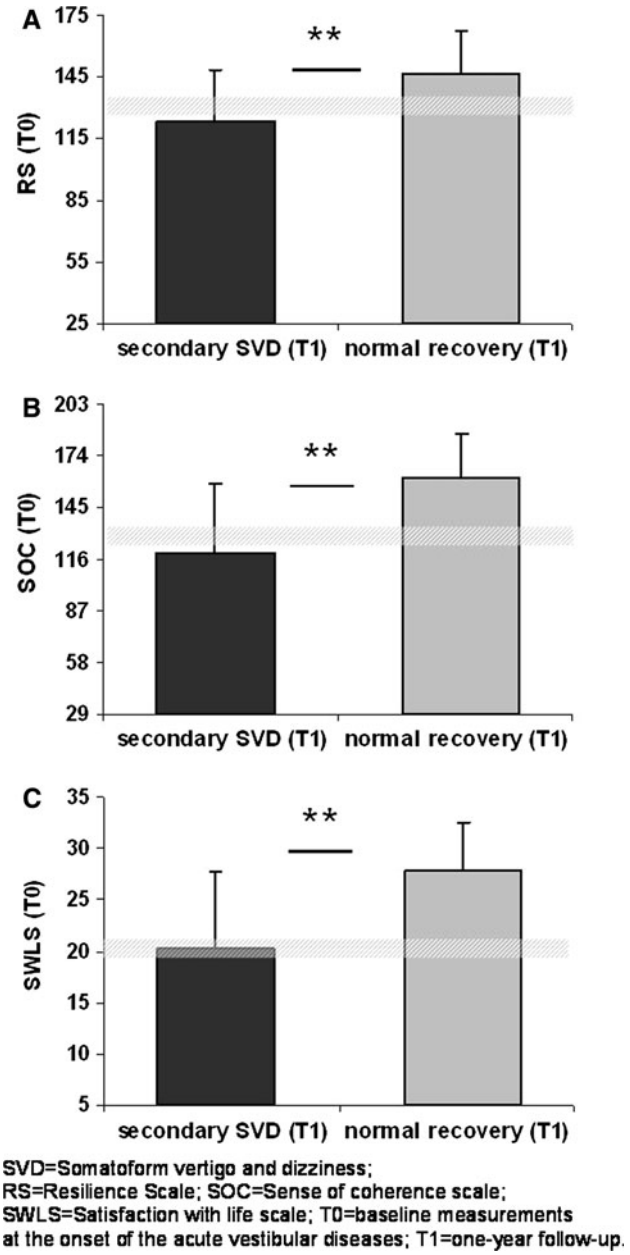

Fig. 2 Discrimination of patients with secondary SVD (n = 25) and patients with normal recovery (n = 27) by resiliency, sense of coherence, and quality of life

variables provided a distinct contribution to the development of secondary SVD at T1, with a good fit to the data (GFI = 0.93, NFFI = 0.99, and RMSEA = 0.000). The correlation of $r = -0.58$ indicated a significant negative association between lifetime mental disorders and subjective well-being ($p < 0.001$) at T0. The higher the extent of subjective well-being, the lower was the diagnosis for lifetime mental disorders. The correlation of $r = 0.50$ notified a significantly positive correlation between mental comorbidity and stressful life events ($p < 0.001$) at T0. Stressful life events were coincidental with mental comorbidity at T0. The standardized estimate of $\beta = 0.23$ indicated a direct effect from mental comorbidity (T0) on the development of secondary SVD (T1) ($p < 0.001$). The risk for developing secondary SVD at T1 increased with a mental comorbidity at T0. The direct effect of $\beta = -0.53$ denoted a negative ('causal') correlation between subjective well-being (T0) and secondary SVD (T1). The risk for developing secondary SVD at T1 decreased with higher scores on subjective well-being at T0.

Discussion

Persisting vertigo or dizziness indicates handicapped activity, increased health care utilization, psychosocial dysfunction, and chronicity [31, 38, 44, 48]. Many cross-sectional studies identified various triggers associated with a poor prognosis [3, 8, 12, 30, 33, 36, 42]. In contrast, only a few prospective studies examined specific vestibular vertigo subgroups with respect to long-term symptom severity and subjective handicap. Several risk factors for persisting vertigo or dizziness could be differentiated: (a) one factor was the *uncontrollability of attacks* in patients as indicated by MD and VM in contrast to VN and BPPV, (b) a higher *(lifetime) mental comorbidity*, and (c) anxiety-related *fear of body sensation* or *cognitive appraisal* [4, 12, 19–21, 25]. Thus, vestibular vertigo carries an increased risk of developing secondary SVD even after years without any evidence of a renewed vestibular dysfunction.

The present study examined 59 patients with an acute vestibular disease or dysfunction concerning the development of secondary SVD 1 year after admission. This is the first study which analyzed risk and preventive factors in relation to the long-term prognosis of vertigo and dizziness. On the one hand we explored the *dispositional psychopathology* at the onset of the disease as an influence factor for chronicity. On the other hand we were interested in the extent of coping capacity and examined *resiliency, the sense of coherence and subjective quality of life* as influencing factors for a normal recovery. Based on a multidimensional approach, we assumed secondary SVD to a result in vestibular vertigo syndromes both from dispositional psychopathology and insufficient coping capacity.

One year after admission, 43% of the total sample suffered from secondary SVD without any current vestibular deficit or dysfunction of pathological relevance. Differentiating subtypes, 58.5% of the patients with VM, 40% with BPPV, 37.5% with MD, and 17% with VN developed secondary SVD at 1-year follow-up. Contradictory to the literature, only few patients with VN suffered from secondary SVD. One reason for this might be the different course of illness: In the acute phase of VN, patients frequently suffer from long-lasting vertigo with poor general

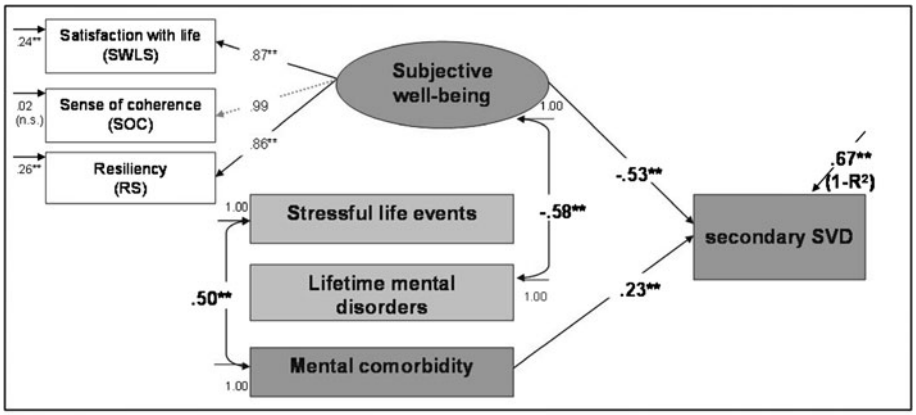

Fig. 3 LISREL hybrid model for the prediction of secondary SVD versus normal recovery in persisting vertigo and dizziness one year after vestibular disease onset ($n = 52$)

condition; subsequently after weeks symptoms improve gradually. Patients with BPPV, MD, and VM contrary suffer from suddenly relapsing vertigo attacks, which anticipate anxiety and a loss of control. Another reason could be found in the specific characteristic of the sample: In comparison to patients with BPPV, VN, and VM, patients with VN showed less frequently lifetime mental disorders and subsequently less dispositional psychopathology for maladaptive coping. Our sample further comprises a large number of VM and a small number of MD, but both developed frequently secondary SVD. This is in line with earlier studies, which found extensive mental comorbidity in patients with VM and MD [3, 4, 8, 12, 33, 36].

In our total sample, secondary SVD was most frequently a correlate of depressive disorders (48%), anxiety (32%), and somatoform disorders (20%). Patients with secondary SVD revealed a high rate of lifetime mental disorders, stressful life events, and frequently mental comorbidities at vestibular disease onset. Lifetime mental disorders were strongly associated with higher levels of dizziness-specific anxiety. Strong evidence for the correlation of mental comorbidity, dizziness symptom severity, and anxious illness behavior could be found in the literature [4, 12, 13, 31, 38, 44, 48]. A new but predicted finding was that patients with a normal recovery at 1 year after admission showed higher scores on all protective factors of subjective well-being than patients with secondary SVD. Furthermore, they demonstrated less dizziness-specific anxiety at the onset of the vestibular disease. Mendel et al. [29] were the first to examine the relationship between peripheral vestibular disorders and the sense of coherence (SOC). They showed that high SOC scores were significantly correlated with lower handicap scores, psychosocial dysfunction, and mental comorbidity. SOC was postulated as an important predictor for dizziness-specific quality of life [29]. In a representative German study, patients without lifetime mental disorders reached higher scores on SOC [24]. Other studies described a significantly negative correlation between mental disorders and the SOC [16, 17]. Especially avoidance behavior as one maladaptive coping strategy reached significant predictive value for extensive handicap in patients with MD [23]. SOC was identified as a preventive factor for anxiety, depression, and distress [36]. Yardley [49] found the combination of low internal attribution and dependence upon others as a trigger for distress and handicapped activity in patients with vertigo. Other authors declared subjective well-being as a function of a dispositional psychopathology, which influences the experience of health markedly [28]. However, patients' subjective assessment of well-being can widely disagree with the objective diagnostic assessment of health [16, 17]. In this context, positive correlations between SOC and good subjective perceived health status were found reaching predictive value for a better health quality of life [28, 35]. Referring to our results of the study, we assume that vestibular vertigo patients with good health protection factors (e.g., RS, SOC, SWLS) assess their symptoms in a more adaptive (cognitive and emotional) manner with respect to relapsing attacks, duration, and treatment compliance. Anticipating personal controllability might trigger active coping mechanism, particularly with regard to an adequate vestibular compensation [12, 47, 49].

Main limitations of our study address the relatively low sample size of $n = 59$ and the unequally distributed number of patients in different vestibular subgroup (e.g., VM vs. MD). Nevertheless, our prospective study is the first addressing the development and prediction of secondary SVD in a well-defined group of patients with vestibular vertigo syndromes.

Our hybrid model (Fig. 3) displayed an interesting mediating effect from lifetime mental disorders via subjective well-being to secondary SVD. Lifetime mental disorders were negatively correlated with factors of subjective

well-being. To summarize, low subjective well-being with frequently lifetime mental disorders was a significant risk factor for the development of secondary SVD, and high subjective well-being with infrequently lifetime mental disorders was a preventive factor for secondary SVD, respectively. Somewhat smaller was the predictive effect for mental comorbidity on the development of secondary SVD. Patients with a mental comorbidity at the onset of the vestibular disease were more frequently prone to develop secondary SVD in comparison to patients without a mental comorbidity at baseline.

In conclusion, both the dispositional psychopathology and subjective well-being as aspects of coping capacity played a central role for the long-term prognosis of patients with vestibular vertigo syndromes. To prevent a chronic course of secondary SVD, patients should be screened for at risk-status at the onset of the vestibular disease (i.e., patients with VM), and offered psychotherapeutic programs tailored to the patients' disease-specific needs.

Acknowledgments We would like to thank the patients for their participation in the study. This work was supported by a grant of the Deutsche Forschungsgemeinschaft (EC 220/2-1).

Conflict of interest None.

References

1. Antonovsky A (1993) The structure and properties of the sense of coherence scale. Soc Sci Med 36:725–733
2. Balaban CD, Thayer JF (2001) Neurological bases for balance-anxiety links. J Anxiety Disord 15:53–79
3. Best C, Eckhardt-Henn A, Diener G, Bense S, Breuer P, Dieterich M (2006) Interaction of somatoform and vestibular disorders. J Neurol Neurosurg Psychiatry 77:658–664
4. Best C, Eckhardt-Henn A, Tschan R, Bense S, Dieterich M (2009) Psychiatric morbidity and comorbidity in different vestibular vertigo syndromes. Results of a prospective longitudinal study over one year. J Neurol 256:58–65
5. Best C, Tschan R, Eckhardt-Henn A, Dieterich M (2009) Who is at risk for ongoing dizziness and psychological strain after a vestibular disorder? Neuroscience 164:1579–1587
6. Best C, Eckhardt-Henn A, Tschan R, Dieterich M (2009) Why do subjective vertigo persist over one year after a vestibular vertigo syndrome? Ann NY Acad Sci 1164:334–337
7. Breslau N, Lipton RB, Stewart WF, Schultz LR, Welch KM (2003) Comorbidity of migraine and depression: investigating potential etiology and prognosis. Neurology 60:1308–1312
8. Celestino D, Rosini E, Carucci ML, Marconi PL, Vercillo E (2003) Menière's disease and anxiety disorders. Acta Otorhinolaryngol Ital 23:421–427
9. Diener E, Emmons RA, Larsen RJ, Griffin S (1985) The Satisfaction with life scale. J Pers Assess 49:71–75
10. Diener E (2000) Subjective well-being: the science of happiness and proposal for a national index. Am Psychol 55:34–53
11. Dieterich M, Brandt T (1993) Ocular torsion and tilt of subjective visual vertical are sensitive brainstem signs. J Pers Assess 33:292–299
12. Eckhardt-Henn A, Best C, Bense S, Breuer P, Diener G, Tschan R, Dieterich M (2008) Psychiatric comorbidity in different vestibular vertigo syndromes. J Neurol 255:420–428
13. Eckhardt-Henn A, Breuer P, Thomalske C, Hoffmann SO, Hopf HC (2003) Anxiety disorders and other psychiatric subgroups in patients complaining of dizziness. J Anxiety Disord 7:369–388
14. Eckhardt-Henn A, Dieterich M (2005) Psychiatric disorders in otoneurologic patients. Neurol Clin 23:731–749
15. Eckhardt-Henn A, Tschan R, Best C, Dieterich M (2009) Somatoform vertigo syndromes. Nervenarzt 80:909–917
16. Eriksson M, Lindström B (2007) Antonovsky's sense of coherence scale and its relation with quality of life: a systematic review. J Epidemiol Health 61:938–944
17. Eriksson M, Lindström B (2006) Antonovsky's sense of coherence scale and its relation with health: a systematic review. J Epidemiol Health 60:331–376
18. Furman JM, Balaban CD, Jacob RG, Marcus DA (2005) Migraine-anxiety related dizziness (MARD): a new disorder? J Neurol Neurosurg Psychiatry 76:1–8
19. Godemann F, Koffroth C, Neu P, Heuser I (2004) Why does vertigo become chronic after neuropathia vestibularis? Psychosom Med 66:783–787
20. Godemann F, Schabowska A, Naetebusch B, Heinz A, Strohle A (2006) The impact of cognitions on the development of panic and somatoform disorders: a prospective study in patients with vestibular neuritis. Psychol Med 36:99–108
21. Godemann F, Siefert K, Hantschke-Brüggemann M, Neu P, Seidl R, Ströhle A (2005) What accounts for vertigo one year after neuritis vestibularis-anxiety or a dysfunctional vestibular organ? J Psychiatr Res 39:529–534
22. Grimm LG, Yarnold PR (2000) Reading and understanding MORE multivariate statistics. American Psychological Association, Washington, DC
23. Hägnebo C, Andersson G, Melin L (1998) Correlates of vertigo attacks in Menière's disease. Psychother Psychosom 67:311–316
24. Hannöver W, Michael A, Meyer C, Rumpf HJ, Hapke U, John U (2004) Antonovsky's sense of coherence scale and presentation of a psychiatric diagnosis. Psychother Psychosom Med Psychol 54:179–186
25. Heinrichs N, Edler C, Eskens S, Mielczarek MM, Moschner C (2007) Predicting continued dizziness after an acute peripheral vestibular disorder. Psychosom Med 69:700–707
26. Honrubia V (1994) Quantitative vestibular function tests and the clinical examination. In: Herdmann SJ (ed) Vestibular rehabilitation. Davis, Philadelphia, pp 113–164
27. Jöreskog KG, Sörbom D (2005) LISREL for Windows (Computer Software). Scientific Software International, USA
28. Leppert K, Gunzelmann T, Schumacher J, Strauss B, Brähler E (2005) Resilience as a protective personality characteristic in the elderly. Psychother Psychosom Med Psychol 55:365–369
29. Mendel B, Bergenius J, Langius A (2001) The sense of coherence: a tool for evaluating patients with peripheral vestibular disorders. Clin Otolaryngol 26:19–24
30. Nagarkar AN, Gupta AK, Mann SB (2000) Psychological findings in benign paroxysmal positional vertigo and psychogenic vertigo. J Otolaryngol 29:154–158
31. Neuhauser HK (2007) Epidemiology of vertigo. Curr Opin Neurol 20:40–46
32. Radtke A, Popov K, Bronstein AM, Gresty MA (2000) Evidence for vestibulo-cardiac reflex in man. Lancet 356:736–737
33. Savastano M, Maron MB, Mangialaio M, Longhi P, Rizzardo R (1996) Illness behaviour, personality traits, anxiety, and depression in patients with Menière's disease. J Otolaryngol 25:329–333
34. Schumacher J, Leppert K, Gunzelmann T, Strauss B, Brähler E (2004) Die Resilienzskala - Ein Fragebogen zur Erfassung der

psychischen Widerstandsfähigkeit als Personmerkmal. Z Klin Psych Psychia 53:16–39
35. Schumacher J, Wilz G, Gunzelmann T, Brähler E (2000) The Antonovsky Sense of Coherence Scale. Test statistical evaluation of a representative population sample and construction of a brief scale. Psychother Psychosom Med Psychol 50:472–482
36. Söderman AC, Bagger-Sjöbäk D, Bergenius J, Langius A (2002) Factors influencing quality of life in patients with Menière's disease, identified by a multidimensional approach. Otolol Neurotol 23:941–948
37. Staab JP, Ruckenstein MJ (2003) Which comes first? Psychogenic dizziness versus otogenic anxiety. Laryngoscope 113:1714–1718
38. Staab JP (2000) Diagnosis and treatment of psychologic symptoms and psychiatric disorders in patients with dizziness and imbalance. Otolaryngol Clin North Am 33:617–635
39. Struempfer DJW, Gouws JF, Viviers MR (1998) Antonovsky's Sense of Coherence scale related to negative and positive affectivity. Eu J Pers 12:457–480
40. Tschan R (2008) Predictors for the development of secondary somatoform vertigo and dizziness. Dissertation, Johannes Gutenberg-University Mainz
41. Tschan R, Wiltink J, Best C, Bense S, Dieterich M, Beutel M, Eckhardt-Henn A (2008) Validation of the German version of the Vertigo Symptom Scale (VSS) in patients with organic or somatoform dizziness and healthy controls. J Neurol 255:1168–1175
42. Von Brevern M, Radtke A, Lezius F, Feldman M, Ziese T, Lempert T, Neuhauser HK (2007) Epidemiology of benign paroxysmal positional vertigo: a population-based study. J Neurol Neurosurg Psychiatry 78:710–715
43. Wagnild GM, Younf HM (1993) Development and psychometric evaluation of the resilience scale. J Nurs Meas 1:165–178
44. Wiltink J, Tschan R, Michal M, Subic-Wrana C, Eckhardt-Henn A, Dieterich M, Beutel ME (2009) Dizziness: anxiety, health care utilization and health behaviour—results from a representative German community survey. J Psychosom Res 66:417–424
45. Wittchen HU, Burke JD, Semler G, Pfister H, Von Cranach M, Zaudig M (1989) Recall and dating of psychiatric symptoms. Test-retest reliability of time-related symptom questions in a standardized psychiatric interview. Arch Gen Psychiatry 46:437–443
46. Yardley L, Masson E, Verschuur C, Haacke N, Luxon L (1992) Symptoms, anxiety and handicap in dizzy patients: development of the vertigo symptom scale. J Psychosom Res 36:731–741
47. Yardley L, Redfern MS (2001) Psychological factors influencing recovery from balance disorders. J Anxiety Disord 15:107–119
48. Yardley L (2000) Overview of psychologic effects of chronic dizziness and balance disorders. Otolaryngol Clin North Am 33:603–616
49. Yardley L (1994) Vertigo and dizziness. Routledge, London