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Article

# Perceived Health Benefits in Vestibular Schwannoma Patients with Long-Term Postoperative Headache: Insights from Personality Traits and Pain Coping—A Cross-Sectional Study

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**Abstract:** Postoperative headaches (POH) following retrosigmoid microsurgery for vestibular schwannoma (VS) can significantly diminish patients' perceived health benefits (PHB). A survey of 101 VS patients, utilizing the Rostock Headache Compendium, Glasgow Benefit Inventory, Ten-Item Personality Inventory (TIPI-G), and German pain processing questionnaire (FESV), revealed that almost half experienced POH, leading to a markedly reduced overall PHB compared to those without POH. This decrease in PHB was linked to higher levels of pain-related helplessness, depression, anxiety, and anger. Positive associations were found between PHB and action-planning competence, cognitive restructuring, and experience of competence. Personality traits, particularly low emotional stability and openness, were associated with pain-related psychological impairment. Interestingly, hearing loss and facial paresis did not impact PHB. The study underscores the influence of pain-related mental interference and coping strategies on PHB in long-term POH patients, suggesting a role for personality traits in their pain management. The findings advocate for short-term psychological interventions, emphasizing adaptive coping mechanisms like cognitive restructuring, to enhance PHB in VS patients post-microsurgery.

**Keywords:** vestibular schwannoma; postoperative headache; microsurgery; personality traits; coping mechanisms; perceived health benefits; pain coping

## 1. Introduction

Vestibular schwannoma (VS) is a benign tumor originating from the N. vestibulocochlearis and microsurgery is a common treatment option. Previous studies showed that microsurgery, especially for smaller VS, might lead to a decrease in perceived health benefits (PHB) compared to conservative therapy and radiotherapy [1–3]. However, this negative impact might be reduced over time [4]. Other than treatment, there are several different symptoms that affect PHB in VS patients: age [5,6], vertigo or dizziness [6–9], (impaired) facial nerve function [2,5], depression [3,8], anxiety [9,10] and postoperative headache (POH) [8,9,11]. POH in VS patients was shown to be related to surgical approach, age and tumor size [12]. Studies suggest that the retrosigmoid approach is associated with higher rates of POH [13,14].

Literature on personality traits in VS patients is rather sparse. However, according to Ribeyre et al. [15] psychological factors account for 77.3 % of the differences in short-term postural recovery from surgery-related balance impairment (one month), 36.6 % of the differences in mid-term postural

recovery (three months), and 79.3 % of the differences in long-term postural recovery (one year). They suggest that personality traits such as high anxiety, focus on negative emotions, and challenges in self-care could hinder the process of postural recovery.

In terms of primary headaches, a vast majority of studies has shown associations between different types of headache and personality traits. A meta-analysis by Garramone et al suggests that migraineurs tend to have high expressions in neuroticism and low expressions in extraversion [16]. Özdemir et al found that patients with migraine also tend to have maladaptive and ineffective coping responses [17]. In accordance, Aaseth et al [18] showed that individuals with chronic tension-type headache had a significantly higher neuroticism score and a significantly higher level of psychological distress than the general population. Bigal et al [19] examined the psychological profiles of patients with chronic daily headache, using a case-control design. They assessed 791 patients with different subtypes regarding their personality using the Minnesota multiphasic personality inventory (MMPI)-2 and compared them to control groups of migraine and chronic posttraumatic headache patients. The findings showed that psychopathological factors, such as hypochondria, depression, schizophrenia and social introversion are more common in patients with analgesic rebound headache and chronic migraine than in migraineurs.

In a study by Rausa et al [20], it was discovered that 46.8% of chronic daily headache patients (N = 94) had psychiatric comorbidities, primarily mood and anxiety disorders. These patients exhibited elevated scores in the neurotic triad, particularly in hypochondria, while showing mild levels of depression and hysteria scales of the Minnesota Multiphasic Personality Inventory-2. Patients reported high health concerns. The results suggest that neurotic personality traits are significantly more prevalent in headache patients with psychiatric comorbidities. Yang et al [21] found that comorbidity with personality disorders was associated with more severe forms of migraine symptoms. Migraineurs with an additional diagnosis of personality disorder showed a higher frequency of headaches.

In the first study of our project, we explored associations between premorbid psychological factors and POH. We found that premorbid mental ailments, preexisting headaches, premorbid chronic pain syndromes, and higher somatization tendencies were more common in individuals experiencing POH. A regression analyses revealed that the number of premorbid psychosomatic symptoms, preexisting mental ailments, and premorbid chronic pain syndromes predicted POH. The findings suggest a significant role for premorbid psychological factors in the emergence of POH after microsurgery, emphasizing the need for psychological screening before surgery.

However, there is still a lack of data regarding associations between personality traits, coping mechanisms and PHB in VS patients experiencing long-term POH. Therefore, the objectives of the current cross-sectional study were to 1) assess the PHB in individuals with VS experiencing POH after receiving retrosigmoid microsurgery in comparison to those without POH, 2) analyze the personality traits of VS patients with long-term POH, and 3) investigate the associations between personality traits and coping mechanisms concerning POH in VS patients. In the last step, we aimed to identify pain-related psychological impairment and coping mechanisms regarding POH as potential predictors of PHB.

## 2. Materials and Methods

This cross-sectional single-center study was part of a larger study carried out at University Hospital Halle, Germany. Diagnosis of VS, age older than 18 at diagnosis, retrosigmoid surgery, and native German language proficiency were considered inclusion criteria. Patients with previous surgery or radiation and/or recurrent VS and those with additional oncological diagnosis or neurofibromatosis type 2 were excluded from study participation. With the study starting in early 2020, patient recruitment was delayed by the Covid-19 pandemic. Participants were approached directly during the chief resident consultation at University Hospital Halle. After the national lockdown began, the Vereinigung Akustikus Neurinom e.V (a non-profit patient self-help organisation) called for participation to complete an online survey (SoSciSurvey). Both surveys used

identical questions. Before participating in the study, all participants provided written consent. The study was approved by the Ethics Committee of University Hospital Halle (No. 2020-008).

A brief self-administered questionnaire was used to determine demographic factors such as age at onset, time of surgery, and sex at birth. Tumor size was assessed in Koos grade, ranging from 1 to 4 [22]. POH was characterized as a persistent, ongoing headache that began more than three months following retrosigmoid surgery. The Rostock Headache Compendium (RoKoKo) was used to assess POH to categorize the symptoms as migraine (continuous), tension-type headaches, or other headaches [3,8]. The comprehensive findings regarding POH are discussed in Thomas et al [24]. Participants were asked to rank their pain on a numeric analogue scale (NAS) from 1 to 10.

In addition, the patients were evaluated using the Glasgow Benefit Inventory (GBI). The GBI is a validated post-interventional questionnaire consisting of 18 items. It can be used to assess patients' PHB after undergoing an intervention, e.g. surgery. The set of 18 questions focuses on various aspects of general, social, and physical health. Scores span from -100 to +100, where a score of zero signifies no benefit, +100 represents the highest level of benefit and negative scores indicate worsening [25].

In patients with a chronic or recurrent pain issue, the German pain processing questionnaire (Fragebogen zur Erfassung des Schmerzverhaltens, FESV) [26] is used to evaluate the patients' psychological pain-related mental interference (questionnaire BE) as well as cognitive and behavioral coping mechanisms regarding pain (questionnaire BW). Three main components and nine individual dimensions were evaluated for pain processing: cognitive pain management, behavioral pain management, and pain-related mental interference. The components of action-planning competence (APC), cognitive restructuring (CR), and experience of competence (EC) make up cognitive pain coping. Mental distraction (MD), counteractive activities (CA), and rest and relaxation (RR) strategies are all parts of behavioral pain coping. The subscales of pain-related helplessness and depression (HD), pain-related anxiety (ANX), and pain-related anger (ANG) make up the pain-related psychological impairment scale [26].

To assess the Big Five personality traits as described by McCrae and Costa [27], we used the Ten Item Personality Inventory (TIPI-G) [28]. The five components of this personality model are emotional stability (the polar opposite of neuroticism), extraversion, agreeableness, openness, and conscientiousness. When testing time is restricted, this short version of the questionnaire provides an accurate approximation for longer measurements of the five-factor model of personality, such as the NEO-PI-R [29].

Statistical analysis was performed using SPSS software Version 28.0 [30]. A level of significance at  $\alpha = 0.05$  was applied. Mann-Whitney-U-tests were used for group comparisons. Spearman-Rho ( $r_s$ ) correlations were calculated for a robust estimation even in the case of non-normal distribution. False discovery rate correction [31] was applied to account for multiple testing [32]. A step-wise regression analysis was conducted to identify pain-related psychological impairment and coping mechanisms as predictors for PHB. Goodness-of-fit was determined according to Cohen [33].

### 3. Results

A total of 101 participants who received microsurgery via the retrosigmoid approach were surveyed, and 54 reported POH. After excluding nine patients with incomplete questionnaires or missing tumor size, 92 participants were included in the evaluation. For POH patients, the mean age at survey was 53.9 years ( $SD = 12.7$ ), and the mean age at diagnosis was 45.9 years ( $SD = 10.0$ ). The average time span between surgery and the surgery was 8.0 years ( $SD = 9.4$ , Median = 3.5). Seven patients reported Koos grade 1 (14 %), 14 reported grade 2 (28 %), 20 grade 3 (40 %), and 9 grade 4 (18 %). Thirty-seven participants (74 %) were female. The current average POH pain level was ranked at 6.7 (range 1-10). The characteristics of the study sample are summarized in Table 1. The results of the conducted Mann-Whitney-U-tests are shown in Table 2 and a comprehensive correlation matrix can be found in Table 3.

**Table 1.** Descriptive data of demographic variables and used questionnaires for VS patients experiencing POH (n = 50).

variables/ questionnaire scales	minimum	maximum	M (SD)
age			
age at onset	30	75	53.94 (12.68)
time since treatment in years	28	69	45.92 (10.04)
pain (NAS)	1	36	8.02 (9.36)
	2	10	6.65 (2.13)
<i>TUPI-G</i>			
extraversion	2	14	8.04 (3.20)
agreeableness	6	14	10.50 (2.23)
conscientiousness	8	14	12.37 (1.58)
emotional stability	2	14	9.6 (3.34)
openness	5	14	10.58 (2.48)
<i>FESV</i>			
HD	5	30	15.40 (7.71)
ANX	4	24	10.77 (6.12)
ANG	5	26	11.15 (6.29)
APC	4	24	15.55 (5.33)
CR	4	24	14.70 (5.56)
EC	4	24	16.08 (5.56)
MD	4	18	7.94 (4.01)
CA	3	20	8.34 (4.30)
RR	4	24	11.49 (5.58)
<i>GBI</i>			
global	-100.00	75.00	-23.19 (34.93)
social support	-83.33	66.67	0.31 (27.44)
physical health	-83.33	33.33	-21.96 (31.86)
overall	-80.56	63.69	-20.09 (25.68)

*Abbreviations.* TIPI-G = Ten Item Personality Inventory German, FESV = German pain processing questionnaire, HD = helplessness and depression, ANX = anxiety, ANG = anger, APC = action-planning competence, CR = cognitive restructuring, EC = experience of competence, MD = mental distraction, CA = counteractive activities, RR = rest and relaxation, GBI = Global Benefit Inventory.

### 3.1. POH and PHB

Participants with POH reported significantly lower levels of total PHB (Table 2).

**Table 2.** Mann-Whitney-U-Tests for group comparisons of patients with and without POH regarding PHB.

questionnaire scales	POH (n = 50)	non POH (n = 42)	<i>p</i>	<i>FDR-corrected</i> <i>p</i>	Cohen's <i>d</i>
<i>GBI</i>					
general	-23.4 (34.6)	-10.9 (27.5)	.16	.21	-
social support	-0.9 (29.5)	1.1 (20.6)	.56	.56	-
physical health	-23.2 (32.0)	-9.1 (21.5)	.049	.098	-
total	-20.7 (25.3)	-8.6 (19.9)	.01	.04	0.52

*Abbreviations.* FDR = False Detection Rate, GBI = Global Benefit Inventory.

### 3.2. Age, Hearing loss, facial paresis and pain

Younger age was associated with higher levels of pain-related anxiety and anger, whereas older age was associated with higher levels of experience of competence. Hearing loss was associated with older age, high levels of pain-related anxiety and anger, as well as lower levels of cognitive restructuring. With regard to personality traits, hearing loss was associated with low levels of extraversion. There were no significant correlations regarding facial paresis (Table 3). Pain severity as reported via NAS was negatively associated with extraversion, emotional stability and openness. Nor age, nor hearing loss or facial paresis were significantly associated with any of the GBI scores. Time since treatment was not significantly associated with general ( $r_s = .05$ ,  $p = .76$ ), social support ( $r_s = .20$ ,  $p = .16$ ), physical health ( $r_s = .15$ ,  $p = .31$ ) and total GBI scores ( $r_s = .20$ ,  $p = .17$ ).

### 3.3. Pain-related mental interference, pain coping and personality traits

High pain-related anxiety and anger levels were associated with low levels of extraversion, emotional stability and openness. Low emotional stability and openness were also associated with high pain-related helplessness and depression. Experience of competence was significantly associated with extraversion and emotional stability (Table 3).

### 3.4. Pain-related mental interference, coping mechanisms and perceived health benefits

Pain-related helplessness and depression, and anxiety were significantly associated with lower general, physical health and total GBI scores. Pain-related anger was also associated with lower levels of the total GBI score (Table 3). In terms of pain coping, higher levels of action-planning competence, cognitive restructuring and experience of competence were associated with higher general and total GBI scores. Cognitive restructuring and experience of competence also correlated significantly with the physical health subscale.

### 3.5. Personality and perceived health benefits

Extraversion was the only personality trait that yielded a significant correlation with PHB and was associated with the physical health GBI score (Table 3).

### 3.6. Predictors for perceived health benefits

The step-wise regression analysis identified pain-related helplessness and depression ( $\beta = -.34$ ) as well as cognitive restructuring ( $\beta = .37$ ) as predictors for total GBI (i.e. PHB) ( $F(2, 46) = 11.13$ ,  $p < 0.01$ ,  $R^2 = .33$ ).

**Table 3.** Comprehensive correlation matrix for personality, psychological burden and perceived health benefit as well as demographic and disease-related variables.

	<i>FESV</i>									<i>HADS-D</i>			<i>GBI</i>						
	HD	ANX	ANG	APC	CR	EC	MD	CA	RR	depression	anxiety	total	hearing loss	facial paresis	pain (NAS)	general	social support	physical health	total
gender	-.08	-.04	-.15	-.13	.17	.17	.01	-.24	.23	-.28	-.05	-.16	-.05	.23	.03	.12	-.06	.26	.24
age	-.27	-.32*	-.32*	.08	.27	.30*	.18	-.23	.22	-.18	-.26	-.23	-.31*	.05	-.20	-.02	.30	.25	.20
hearing loss	.16	.29*	.37**	-.13	-.33*	-.19	-.17	.11	.01	.37**	.04	.20	-	-	-	.01	-.16	-.06	-.12
facial paresis	-.03	.01	-.23	.14	.06	.02	-.11	-.13	-.16	-.13	.09	-.02	-	-	-	.17	-.07	-.07	.18
pain (NAS)	.24	.21	.19	.11	.01	-.10	-.23	-.17	.15	.25	.02	.09	-	-	-	-.23	-.08	.18	-.28
<i>TIPI-G</i>																			
extraversion	-.21	-.32*	-.39*	.09	.23	.30*	-.01	.12	-.06	-.49**	-.23	-.34*	-.29*	-.03	-.39**	.07	.14	.33*	.20
agreeableness	-.02	-.03	-.13	.25	-.02	.19	.05	-.24	.18	-.07	-.12	-.10	-.01	.17	-.003	.19	.14	.21	.23
conscientiousness	.10	-.03	.04	-.07	.16	.15	.17	.14	.27	-.06	-.31*	-.24	-.11	-.01	.06	-.14	-.00	-.20	.21
emotional stability	-.42**	-	-.59**	.13	.20	.48**	.01	.02	.09	-.35*	-.63**	-.56**	-.15	-.17	-.31*	.02	.07	.20	-.14
openness	-.46**	-	-.42**	.24	.15	.23	-.12	.12	.05	-.47**	-.29	-.35*	-.17	-.13	-.32*	.11	-.12	.17	.14
<i>GBI</i>																			
general	-.40**	-.35*	-.25	.39**	.40**	.39**	.03	.18	.08	-.25	-.24	-.29	.01	.17	-.23	-	-	-	-
social support	.05	-.06	-.02	.04	.02	.07	-.11	-.14	.06	-.01	.09	.04	-.16	-.07	-.08	-	-	-	-
physical health	-.45**	-.30*	-.25	.18	.33*	.46**	.09	.10	.14	-.40*	-.33*	-.37*	-.06	-.07	-.10	-	-	-	-
total	-.44**	-.37*	-.32*	.31*	.49**	.50**	.13	.20	.10	-.39*	-.27	-.38**	-.12	.15	-.28	-	-	-	-

\*  $p < 0.05$  Abbreviations. TIPI-G = Ten Item Personality Inventory German, FESV = Questionnaire for the Assessment of Pain-related Behavior, HD = helplessness and depression, ANX = anxiety, ANG = anger, APC = action-planning competence, CR = cognitive restructuring, EC = experience of competence, MD = mental distraction, CA = counteractive activities, RR = rest and relaxation,

GBI = Global Benefit Inventory. \*  $p < 0.05$ , \*\*  $p < 0.01$ .

#### 4. Discussion

In this cross-sectional study, we examined the interplay between personality traits, pain coping mechanisms, and PHB among VS patients who underwent retrosigmoid microsurgery and experienced POH. Our study yielded significant insights, revealing associations among personality traits, pain coping, psychological distress and PHB.

Our first investigation showed that prior to the surgical procedure, POH patients had already encountered heightened psychological stress during the preoperative phase [24]. Expanding upon this analysis, we have delved into the contemporary associations among enduring personality traits, coping strategies, and post-surgery PHB.

Higher pain-related anxiety and anger were linked to younger age, while older age was notably associated with enhanced experienced competence. This could be attributed to the accumulation of pain coping experience with advancing age, potentially making younger patients more prone to pain-related mental interference due to POH. Hearing loss was significantly associated with pain-related anxiety and anger. In accordance, the findings of Garnefski and Kraaij [34] indicate a connection between ruminative and catastrophizing coping strategies and higher reports of depression and/or anxiety symptoms among individuals with hearing loss. In contrast, refocusing attention to more pleasant issues, disengaging from unattainable goals, and re-engaging in alternative, meaningful goals were associated with less symptomatology. Nevertheless, the impact of POH appears to be uncertain. The negative association with extraversion may be attributed to communication breakdowns, implying that the impairment is likely to affect frequent communication partners. This discussion contends that the influence of the impairment on others constitutes a concept referred to as "Third-Party Disability"[35]. Contrary to Bender et al [3], neither hearing loss nor facial paresis showed associations with any of the GBI scores. In fact, facial paresis showed no significant correlations with any of the used measures. In contrast to Turel et al [4], time since treatment was not significantly associated with GBI scores.

Regarding personality traits, pain-related mental interference exhibited a negative correlation with extraversion, emotional stability, and openness. This finding shows that individuals with POH show similar personality traits as migraineurs [16–19]. Regarding the trait of openness, Magyar et al [36] found that openness increased the risk of migraine. They also demonstrated that individuals with migraine but without depression achieved higher scores in openness compared to those experiencing depression. In the context of migraines, individuals with migraines who possess greater levels of openness tend to exhibit enhanced flexibility and creativity in their strategies for managing their condition. As a result, this adaptive strategy helps to alleviate the influence of migraines on their daily routines, as demonstrated by a reduced level of functional disruption in migraine sufferers with elevated openness levels [36,37]. Nevertheless, our results did not reveal a noteworthy connection between openness and the utilization of adaptive pain coping strategies. Extraversion and emotional stability were positively associated with experienced competency. In line with Ramírez-Maestre et al [38], extraversion was associated with lower levels of pain intensity (NAS).

The biopsychosocial model considers the interconnectedness of the mind and body, addressing biological, psychological, and social aspects of pain and illness [39]. In contrast, the biomedical disease model focuses on bodily disruption caused by physiological factors. Expanding the biopsychosocial model with a diathesis-stress component could improve chronic pain treatment. Initial distress post-surgery can lead to psychological issues, physical and mental deconditioning, including learned helplessness, anxiety disorders, personality disorders, and unhealthy coping mechanisms. As pain becomes chronic, assessing psychosocial factors becomes crucial for acceptance, maintenance, and suffering. Emotional effects of pain involve behaviors like catastrophizing, fear-avoidance, re-evaluation of beliefs, efficacy, control, vulnerability, and resilience. Catastrophizing and avoidance stem from anticipated pain, exacerbating these behaviors. Patient differences in persistent personality traits as well as self-control and self-efficacy may impact learned helplessness and similar behaviors, but this remains uncertain [39]. Negative affect is likely the most frequently evaluated psychological aspects in individuals with persistent pain. Additionally, emotional strain and psychosocial tension have demonstrated a propensity to escalate the chances of transitioning

from acute to chronic musculoskeletal pain [40]. Our results align with the idea that individuals exhibiting specific personality traits, including reduced extraversion, emotional stability, and openness, are more susceptible to the development of POH following microsurgery.

Regarding PHB, our findings align with previous studies [8,9,11], indicating that individuals with POH report a significantly lower total GBI scores (PHB) compared to those without POH. In individuals experiencing POH, pain-related helplessness, depression, and anxiety exhibited negative correlations with the general, physical health, and overall scores of the GBI. Additionally, elevated levels of pain-related anger were linked to reduced overall GBI scores. These findings suggest that patients experiencing greater pain-related interference regarding POH tend to report notably lower levels of PHB following microsurgery. Regarding coping mechanisms, elevated levels of action-planning competence, cognitive restructuring, and experienced competence were indicative of heightened general, physical health, and overall scores within the GBI assessment. Furthermore, action-planning competence scores exhibited a positive correlation with increased physical health scores in the GBI. Scheidegger et al [41] analyzed 602 chronic primary pain inpatients and revealed three subtypes: 1) severely burdened individuals with low coping skills, 2) mildly burdened individuals with high coping skills, and 3) moderately burdened individuals with moderate coping skills. All subtypes showed improved pain interference, psychological distress, and coping skills after treatment. Pain-related mental interference improved notably in subtypes 1) and 3), while pain intensity decreased significantly only in subtype 3). For subtype 1), targeting relaxation techniques, counteractive activities, and cognitive restructuring post-treatment seemed most promising to reduce pain interference and psychological distress. FESV dimensions did not significantly predict treatment outcomes in subtype 2). Subtype 3) individuals could gain the most by enhancing their sense of competence during treatment. Their results were in accordance with Grolimund et al [42]. Future research on POH following VS removal should explore various coping subtypes to determine the most effective treatment approaches.

Psychological interventions for individuals dealing with POH could be a suitable approach to enhance PHB following microsurgical removal of VS. Following treatment, patients with chronic primary pain experienced notable enhancements in symptoms, cognitive pain coping, and behavioral pain coping. Specifically, distinct improvements were observed in both cognitive and behavioral coping skills. However, when examined through hierarchical linear models, pain coping did not show significant links with decreases in pain intensity. On the other hand, the overall level and enhancements in cognitive pain coping were predictive of reductions in pain interference and psychological distress. From a clinical perspective, it could prove valuable to encourage and engage in cognitive restructuring and action planning during treatment to effectively diminish post-treatment levels of pain interference and psychological distress [43]. Employing strategies to reduce pain-related helplessness and depression, alongside fostering cognitive restructuring skills, appears to be a promising avenue, as indicated by the regression analysis.

### *Limitations*

It is important to consider the study's results in light of certain methodological limitations. Firstly, a potential limitation of this study is the relatively small sample size of 54 VS patients experiencing POH. With a limited number of participants, the findings may not fully capture the diversity and complexity of the population under investigation. A small sample size could lead to reduced statistical power, making it challenging to detect subtle or less common effects or associations. While the study provides valuable insights, the generalizability of the results to a larger VS patient population might be limited, warranting caution when drawing broad conclusions. However, initially testing a novel research hypothesis with a limited number of participants is a prudent approach. This strategy helps prevent excessive allocation of resources such as subjects, time, and financial investments towards establishing an association between a factor and a disorder, especially in cases where no actual effect exists [44].

Further, the preponderance of female patients in this study may introduce a potential bias that could impact the generalizability of the findings. The overrepresentation of one sex could limit the

extent to which the results can be applied to a broader population, particularly since males might respond differently to certain treatments or exhibit varying symptomatology. This sex imbalance could also lead to skewed associations or overemphasis on factors that predominantly affect females. However, no significant sex at birth effects were found in the statistical analysis.

Employing online surveys introduces drawbacks, as the absence of an interviewer precludes the opportunity to address unfamiliar or ambiguous terms. Furthermore, this approach may not capture responses from individuals without internet access, particularly elderly patients, potentially leading to a bias in the respondent pool. Additionally, the anonymity of participation could increase the risk of fraudulent responses [45].

## 5. Conclusions

In conclusion, this study sheds light on the significant impact of POH on the PHB of patients who undergo retrosigmoid microsurgery for VS. Our findings indicate that patients experiencing long-term POH exhibit a notable reduction in overall PHB compared to those without POH. The link between PHB and personality traits, pain-related mental interference, and pain coping is evident, underscoring the intricate interplay between these factors. Specifically, our study underscores that heightened levels of pain-related helplessness, depression, anxiety, and anger are closely associated with lower PHB among POH patients. Conversely, psychological skills such as action-planning competence, cognitive restructuring, and experience of competence demonstrate a positive correlation with PHB. Notably, personality traits, particularly extraversion, emotional stability and openness, are implicated in the extent of pain-related mental interference.

Remarkably, the presence of hearing loss and facial paresis was not found to influence PHB. This suggests that the psychological and emotional dimensions of pain and coping might be more influential determinants in shaping patients' perceived health benefits post-surgery.

These insights emphasize the importance of addressing pain-related mental interference and implementing effective coping mechanisms to enhance PHB in VS patients grappling with long-term POH. Consequently, these insights also unveil implicit implications for preoperative patient education, specifically within the context of informed consent. Interventions focusing on cognitive restructuring hold promise in fostering adaptive coping strategies among POH patients. These findings pave the way for future research and the development of interventions aimed at optimizing the postoperative experience and overall well-being of VS patients enduring the challenges of POH following microsurgery.

Future studies with larger and more balanced and representative sample of both male and female patients could help validate and strengthen the observed relationships and contribute to a more comprehensive understanding of the factors influencing postoperative outcomes in this context.

**Author Contributions:** Conceptualization, MT and BL; methodology, RS; software, RS; validation, CS, BL and SR.; formal analysis, MT; investigation, MT; resources, CS; data curation, MT; writing—original draft preparation, MT; writing—review and editing, MS, HF, MT, BL, SR; visualization, MT; supervision, MT; project administration, BL; All authors have read and agreed to the published version of the manuscript.

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**Informed Consent Statement:** Informed consent was obtained from all subjects involved in the study.

**Data Availability Statement:** The data presented in this study are available on request from the corresponding author. The data are not publicly available due to privacy reasons.

**Conflicts of Interest:** The authors declare no conflict of interest.

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