Meniere's, Migraine & Motion Sickness

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Meniere's, Migraine & Motion Sickness

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Running Head: Meniere's, Migraine & Motion Sickness

Abstract

CONCLUSION Elevated MSS in MD is likely to be a consequence of the onset of MD and not migraine *per se*.

OBJECTIVES Pathologies of the vestibular system influence motion sickness susceptibility (MSS). Bilateral vestibular deficits lower MSS, vestibular neuritis or benign paroxysmal positional vertigo have little overall effect, whereas vestibular migraine elevates MSS. However, less is known about MSS in Meniere's disease (MD), a condition in which many patients experience vestibular loss and migraine symptoms.

METHODS We conducted an online survey that posed diagnostic and disease questions before addressing frequency of headaches, migraines, visual display dizziness (VDD), syncope, social life and work impact of dizziness (SWID4) and motion sickness susceptibility (MSSQ). The two groups were: diagnosed MD individuals with hearing loss (n=751) and non-MD individuals in the control group (n=400).

RESULTS The MD group showed significantly elevated MSS, more headache and migraine, increased VDD, higher SWID4 scores, and increased syncope. MSS was higher in MD than controls only after the development of MD but not before, nor in childhood. Although elevated in MD compared with controls, MSS was lower than migraine patients from past data. Multivariate analysis revealed VDD, SWID4 and MSS in adulthood as the strongest predictors of MD, but not headache nor migraine.

Keywords: Motion sickness; Meniere's disease; migraine; headache; vestibular

Word Count: 2930

Introduction

Motion sickness is commonly provoked by vehicular motion or visual displays which cause sensory conflict [1]. In susceptible individuals, these provocative stimuli elicit nausea and vomiting and other symptoms including headache, sweating, pallor, increased salivation and dizziness. Many of these features of motion sickness resemble symptoms of acute vestibular disease. The relationship of motion sickness to vestibular disease might be described respectively as the 'healthy person in a sick environment *versus* sick person in a healthy environment'.

Certain groups of patients with vestibular pathologies have reduced or elevated risk for motion sickness. Patients with vestibular migraine (VM) have greatly elevated susceptibility as do those with chronic migraine [2,3]. Patients with vestibular neuritis (VN) or benign paroxysmal positional vertigo (BPPV) appear to have little overall difference in susceptibility compared to controls [3,4]. But within this broad picture many individuals up- or down-regulate their sensitivity to motion in response to their vestibular disease [3,4]. Unilateral vestibular loss (UVL) decreases susceptibility but to a lesser extent than BVL [4]. It should be noted that these were compensated UVL patients [4], i.e. who had adapted to sensory conflict caused by the loss of vestibular function on one side, since in the acute phase the usual observation is that UVL patients may be more sensitive to motion. Individuals who have complete bilateral loss of labyrinthine (vestibular apparatus) function appear to be largely immune to motion sickness provoked by physical motion [3] but may have some susceptibility to visually induced motion sickness [5].

However, fewer systematic data are available concerning motion sickness susceptibility in Meniere's disease (MD). A telephone survey of patients with MD suggested that they had elevated motion sickness susceptibility compared to controls but not as elevated as patients with vestibular migraine [6]. Here, we aimed to increase our understanding by screening a large population of Meniere's disease patients and healthy controls with an online version of a

validated motion sickness susceptibility questionnaire (MSSQ) [7,8]. In addition, we investigated possible co-factors which included prevalence of visual display dizziness (VDD), migraine, and syncope. Finally, we asked participants to complete the social life and work impact of dizziness questionnaire [9] (SWID4).

Material and Methods

Participants

We conducted two anonymous online surveys available through the Meniere's Society's website (UK based charity); one version was customised for MD participants and another for Control participants. All participants were provided with briefing information as to the purpose of the survey, and had to indicate consent by clicking the consent agreement button without which they could not proceed to the survey. Participants were free to withdraw at any time. Ethical approval was provided by the relevant ethics committees of Imperial College and University of Westminster.

Survey Questionnaire

The survey comprised the following items: age and gender demographics; questions concerning Meniere's diagnosis, disease duration, vertigo attacks; hearing loss; medication(s); SWID4; VDD; syncope; headache frequency, migraine, MSSQ. These are given in more detail below.

Meniere's disease items included: diagnosis (unilateral *versus* bilateral), disease duration (years), hearing loss (yes/no), number of Meniere's related vertigo episodes >20 minutes in the previous six and previous one month as defined by the AAO-HNS [10], medication(s) (yes/no, medication details). The impact of dizziness on social life and work was evaluated by the SWID4, a set of four social, travel, family and work related questions (single items and total score), which has been validated in patient and control samples [9]. Visual Display Dizziness (VDD) asked whether dizziness experienced when using visual interfaces impeded their use

(smart phones, computers, tablets, etc). An item concerning susceptibility to vasovagal syncope and facilitating factors, circumstances and symptoms was derived from Bosser et al [11]. Other questions concerned frequency of headaches (ranked never, rarely, sometimes, often) and migraine (six items, throbbing, one or both sides of head, photophobia, phonophobia, nausea, clinical diagnosis confirmation, total score=summed items) [12]. Motion Sickness Susceptibility Questionnaire (MSSQ) was divided into three parts for Meniere's patients or two parts for Controls. Part A (MSA) referred to the experience of motion sickness in childhood; Part B (MSB) to the last 10 years of adulthood for controls or the 10 years before disease onset in Meniere's patients; Part C (MSC) after the onset of Meniere's disease. In the analysis, Part B scores from controls were compared to Part C scores from Meniere's patients. Scores for each part can range from 0-27 maximum possible score, higher scores indicating greater level of susceptibility to motion sickness. The MSSQ is a validated questionnaire that reliably predicts motion sickness tolerance from testing in laboratory settings and from vehicular motion [7,8,13].

Statistics

Chi-square, Mann-Whitney, ANOVA and specific comparisons were used to explore differences between groups. Multivariate techniques including logistic regression, multiple linear regression and factor analysis were used to explore the best predictor variables for group classification, dependent variable magnitude and latent variables, respectively.

Results

Eight hundred and ninety six participants completed the MD version of the survey. However, 145 participants declared no hearing loss and were excluded. There were 751 participants in the MD group (mean$\pm$SD: age 49.8$\pm$12.8 years; M/F ratio .15/.85) and n=400 non-MD Control group (age 45.0$\pm$11.2 years; M/F ratio .17/.82). There was no significant gender bias between

MD and Control groups (p=0.619). In the Control group, 72 participants (18%) reported a hearing loss.

Table 1 here

Meniere's disease patients versus Controls

Group differences are shown in Table 1. More Meniere's participants were taking medication (p<.001) versus controls, and by definition all Meniere's participants reported hearing loss (p<.001). Meniere's participants reported significantly higher susceptibility to visual display dizziness VDD (p<.001), more frequent social life, family life, travel and work difficulties as individual questions and as a total SWID4 score (p<.001), more frequent headache (p<.001) and migraine (p<.001), and increased syncope (p<.001) compared to controls (see Figure 1). MSSQ scores were higher in Meniere's patients than controls (p<.001) but only after the development of Meniere's disease and not before disease onset (significant ANOVA interaction F= 78.5 df 2,1930; p<0.001)) (Table 1, Figure 2) .

Multivariate analyses (logistic) were performed in which the dependent variable was Meniere's versus Controls, and predictor variables were age, gender, hearing, medication, VDD, SWID4, syncope, headache, migraine, MSA, MSB, MSC. These analyses were also repeated replacing the MSSQ scores with a single derived score of rise in motion sickness susceptibility from childhood. Significant predictors of Meniere's were higher VDD (p<.05), SWID4 (p<.001), syncope (marginal p=.058), higher MSC (p<.001) and lower MSB (p<.01). The latter MSB with MSC opposite predictor relationship was an artefact due to the relative rise in susceptibility after the onset of Meniere's. To clarify this, a derived rise in motion sickness susceptibility score (MSAC_dif) was calculated as the difference (PartC minus PartA) between Child Part A and Adult

Part C (employing a Part B with Part C difference would be tautological for the Controls since Part C for controls was cloned from Part B, see methods). The results of this logistic regression were very similar to the previous one, except that a greater rise in motion sickness susceptibility (MSAC_dif) became the single motion sickness predictor for Meniere's (p=.002). In these analyses none of the variables age, gender, hearing, medicines, headaches and migraine, were significant predictors. Finally an exploratory factor analysis was performed to provide an overview of the relationships between all these variables (see Table 2). This showed that age (younger), gender (female), headaches & migraine formed a second factor (17% variance) separate from the first factor (30% variance) composed of those variables more closely associated with Meniere's.

Figure 2 here

In order to place the results of this study in a wider context, motion sickness susceptibility questionnaire (MSSQ) adult scores are shown for the current study compared with other patient groups from previous studies [1, 3, 4] after the onset of disease, in Figure 3. The patient groups with corresponding 'n' in brackets were as follows: controls combined from this study and studies [3, 4] (n=525); bilateral vestibular loss (n=17); unilateral vestibular loss (n=45); vestibular neuritis (n=12); benign paroxysmal positional vertigo (n=28); vestibular migraine (n=26); clinical migraine patients attending migraine clinic (n=12); Meniere's disease (n=751). It can be seen in Figure 3 that Meniere's patients had elevated motion sickness susceptibility compared to controls (p<.001) but somewhat lower motion sickness susceptibility compared to vestibular migraine and clinical migraine patients. Vestibular migraine and clinical migraine patients have greatly elevated motion sickness susceptibility by a factor of 1.7 and 1.8 respectively compared with controls, whereas Meniere's disease leads to an increased susceptibility by a factor of 1.5 (see Figure 3).

Figure 3 here

Table 2 here

Frequency of Vertigo attacks in Meniere's patients

The mean (SD) frequency of vertigo attacks in the last 1 month was 3.6 (6.6) attacks and in the last 6 months was 16.4 (39.9) attacks. The wide variation of attack frequency prompted analysis of possible predictors or correlated variables. Since the 1 and 6 month attack frequencies highly intercorrelated (r=.76 p<.0001), a single composite variable was constructed incorporating both 1 & 6 months frequencies by means of combining their z-scores, to give them equal weighting. Having a single composite measure of frequency of attacks simplified analyses. In decreasing order of importance the following were associated with greater frequency of vertigo attacks: higher SWID4 (r=.25 p<.0001); higher VDD (r=.21 p<.0001); greater motion sickness susceptibility post MD onset (r=.19 p<.001); more migraine (r=.16 p<.001); syncope (r=.15 p<.001). Other variables such as sex were not either not significantly associated with frequency of attacks, or for age the association was trivial (r=-.09 p<.05). Multiple linear regression to predict frequency of attacks produced a significant (F=7.5 df 10,630 p<.0001) but weak predictive model (9.2% variance, adjusted Rsquare) with only SWID4 (p<.001), VDD (p<.01) and syncope (p<.05) as predictors, other predictors such as motion sickness susceptibility or migraine now failing significance in the face of the significant predictors in the model. Finally exploratory factor analysis (Varimax rotated) was employed within the Meniere's patients to provide an overview of the latent relationships between vertigo attack

frequency and other variables. Factor 1 (26% variance) loaded frequency of vertigo attacks, SWID4, VDD & MSS post disease. Factor 2 (25% variance) loaded headaches, migraine, syncope & MSS post disease. This suggested that MSS post disease had a complex relationship relating across the different latent dimensions of what might be termed (Factor 1) 'Vertigo-Dizziness' and (Factor 2) 'Migraine-Syncope'.

Unilateral versus Bilateral Meniere's disease

From the seven hundred and fifty-one Meniere's participants, 480 were unilateral and 271 bilateral. Results between unilateral Meniere's and bilateral Meniere's participants are shown in Table 3. Bilateral Meniere's patients had longer disease duration ($p<.001$), were younger at disease onset ($p=.002$), experienced higher number of attacks of vertigo in the previous one month ($p=.004$), higher total SWID4 scores ($p=.002$), and higher motion sickness susceptibility after disease onset (MSC scores) ($p<.001$). Despite higher levels of disease activity (higher number of vertigo attacks) in bilateral MD participants, there was no significant difference in total migraine scores between unilateral and bilateral MD ($p=.228$).

Table 3 here

Discussion

The aim of this experiment was to investigate motion sickness susceptibility in a large population of Meniere's disease patients and controls using an online survey. We also considered possible co-factors including migraine, syncope, visual display dizziness (VDD) and social life and work impact of dizziness (SWID4). Patients with Meniere's disease had elevated

motion sickness susceptibility compared to controls. Higher motion sickness susceptibility occurred only *after* the onset of Meniere's disease but not before nor in childhood, suggesting a causal effect related to the disease. Motion sickness susceptibility scores after diagnosis (MSC scores) were 1.5 times higher in Meniere's disease patients compared with controls. This is similar to that reported in a telephone survey by Sharon & Hullar [6]. Compared with controls, Meniere's disease patients also suffered from more headaches and migraine, increased VDD, higher SWID4 scores, and increased syncope. Further analyses were performed exploring the relationship between Meniere's and motion sickness susceptibility and the possible co-factors. These are discussed below.

Meniere's disease (MD) is a very disabling condition, which has a huge impact on patients' physical and mental health. Alongside episodic attacks of vertigo, Meniere's disease is associated with fluctuating auditory and vestibular signs e.g., hearing loss, tinnitus, aural fullness, dizziness and headache and migraine [10,14]. Regarding the latter, recent studies have highlighted the greater prevalence of migraine in Meniere's disease patients compared to other balance disorders (45% vs 9%) [15]. In the present survey we observed that the Meniere's disease patients scored higher than controls on the migraine scale. It is well known that migraine elevates motion sickness susceptibility [2,3] and in our study bivariate analysis showed an association between migraine and Meniere's disease. However, we found that migraine was not as strongly related to Meniere's disease as other factors in the face of multivariate analyses. This was shown both by logistic regression and by factor analysis (Table 2). Rather than migraine, Meniere's disease was instead more strongly associated with other factors; hearing, medication, visual display dizziness, SWID4, syncope and motion sickness susceptibility. An analogous finding by Bosser and colleagues [11], demonstrated that any relationship between motion sickness susceptibility and migraine in the general population was attenuated after multivariate correction for other factors. More important predictors such as autonomic reactivity replaced migraine. Thus, migraine is unlikely to explain the higher motion sickness susceptibility in Meniere's disease compared to controls. Also consistent with this

view is that Meniere's disease participants do not have as high motion sickness susceptibility as clinical migraine patients themselves (see Figure 3).

A more likely explanation for the elevated motion sickness susceptibility scores in Meniere's disease is increased sensory conflict, since sensory conflict is the underlying mechanism for motion sickness [1]. Visual and vestibular sensory conflicts occur in Meniere's disease during vertiginous symptoms and also during motion sickness [16,17]. Prolonged and recurrent episodes of vertigo in Meniere's disease cause a progressive loss of accurate vestibular perceptions and unstable vestibular gain levels [18]. As such, the sensory conflict during provocative motion stimuli is higher in Meniere's disease compared to healthy controls. This shared aetiology between Meniere's disease and motion sickness may thus exaggerate sensory conflict during provocative motion stimuli.

Bilateral Meniere's disease participants had higher levels of disease activity than unilateral, as indicated by increased numbers of vertigo attacks (Table 3), although others have found no difference [19,20]. We found that bilateral sufferers had higher motion sickness susceptibility than unilateral sufferers (MSC scores). To our knowledge this is the first time that this observation has been reported in the literature. A higher level of disease activity in bilateral sufferers is not surprising as vertigo episodes can begin from either ear which increases the chances of attacks. Furthermore, the bilateral condition decreases the interval between attacks. The continual vestibular changes could therefore relate to higher motion sickness susceptibility, as suggested above as a probable mechanism.

Although not a primary aim of this study, the large variation in frequency of vertigo attacks between individuals suffering Meniere's disease prompted an attempt to find correlates or predictors. This was only partially successful. Bivariate correlations showed that increased frequency of vertigo attacks were associated with significantly higher SWID4 and VDD, greater motion sickness susceptibility post disease, more migraine, more syncope, but other variables such as sex and age showed non significant or trivial relationships. Multivariate analyses within

Meniere's disease patients revealed a straightforward picture at first sight, in which a latent 'vertigo-dizziness' factor emerged independently from a second factor which might be termed 'migraine-syncope'. However, the relationship of elevated motion sickness susceptibility (post disease onset) was more complex, spreading across both these factors, but more strongly with 'vertigo-dizziness'.

The emergence of a vertigo-dizziness factor in multivariate analysis within the Meniere's patients, pulls together vertigo attacks, the SWID4 and VDD, with motion sickness susceptibility (MSC scores). As vertigo attacks in Meniere's disease are sporadic and episodic, the relationship between the number of vertigo attacks and increased difficulty in social, travel, family, and work life is unsurprising and presumably causal. The vertigo-dizziness factor also suggests a possible causal relationship between vertigo attacks and difficulty using visual displays, showing that an everyday task such as using a computer, smart phone, or tablet is sufficiently provocative to induce unease in Meniere's disease.

A possible limitation of this work was the self-report of a doctor's diagnosis of Meniere's disease. Indeed there can be confusion among some physicians as to diagnosis of Meniere's vs migraine or other vestibular related conditions. Although Meniere's disease participants without hearing loss were removed, it is possible that our cohort included a residual number of patients with other vertiginous conditions or had sub-clinical/unrelated hearing loss. However, we asked Meniere's disease participants to score the number of vertigo attacks they experienced in the 6 months and 1 month prior to the online survey. Whilst it could be argued that patients might not recall the number of attacks accurately over a 6 month period, vertigo attacks over 1 month paralleled the 6 month number of vertigo attacks ($r=.76$ $p<.0001$), suggesting accurate recollection. Also, these numbers were almost identical to frequency of vertigo we recently monitored in Meniere's disease patients with diagnostic confirmation by an experienced neuro-otological team. In addition this number of reported vertigo attacks are concordant with those

reported from a large scale Meniere's disease intervention trial in another country [21]. This shows external consistency with the results of this survey.

In conclusion, motion sickness susceptibility, visual display dizziness, social life & work impact of dizziness, migraine, and syncope were elevated in Meniere's disease *versus* Controls. Meniere's disease itself increased Motion Sickness Susceptibility even after accounting for any effects of any associated migraine.

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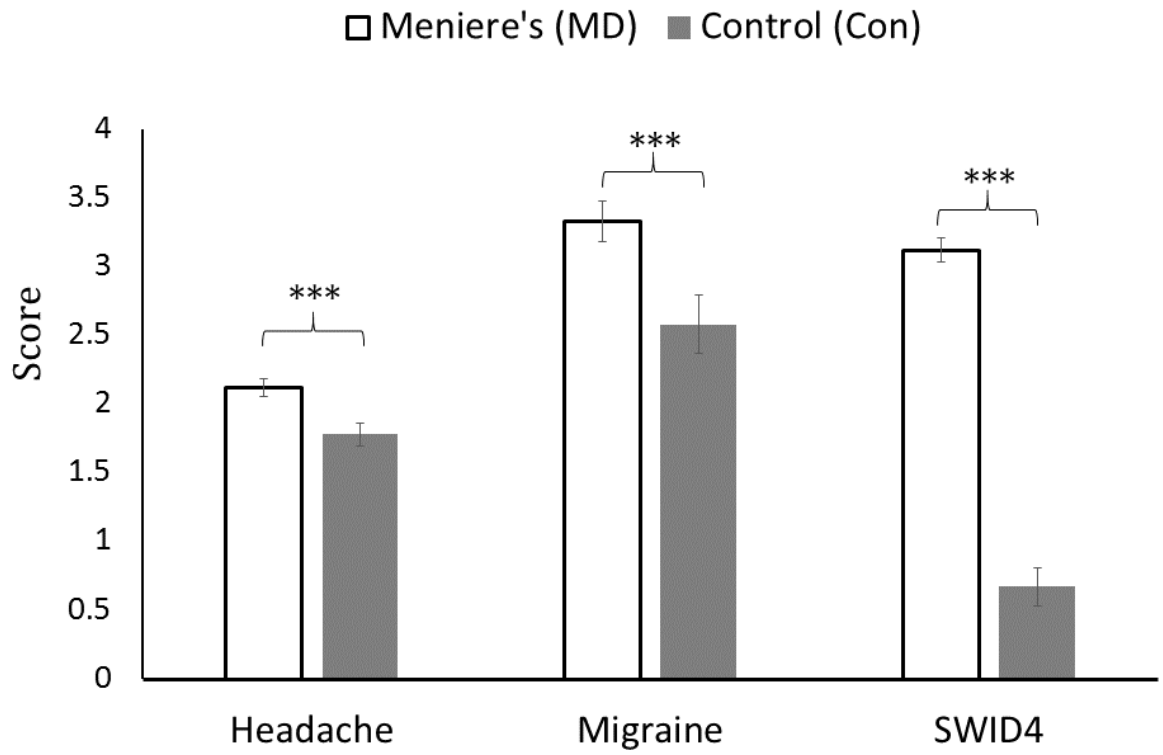

Figure 1: Headache, Migraine and SWID4 mean scores in Meniere's disease (MD) and Controls. Meniere's patients rated their Headache, Migraine and SWID4 scores significantly higher than controls. Error bars are 95%CI.

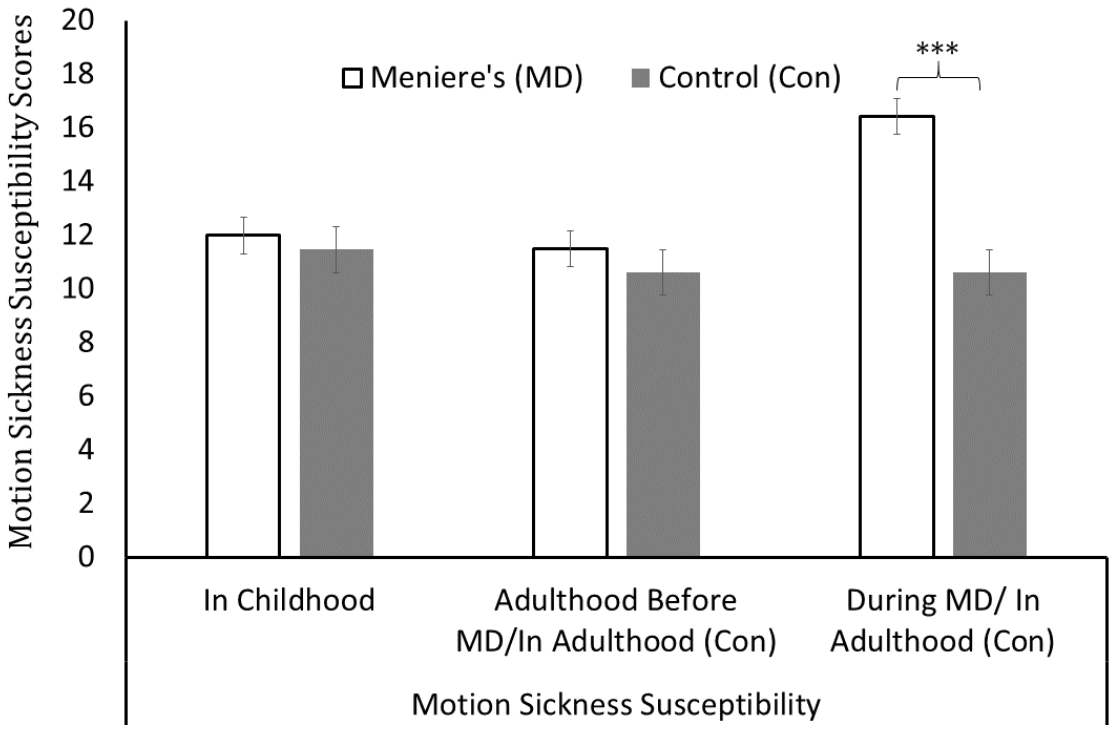

Figure 2: Motion Sickness Susceptibility Questionnaire mean scores in Meniere's (MD) and Control (Con) participants at different stages in life. From left to right: In Childhood; as an adult before MD or the control participant's adult score (Con); and during MD or the control participant's adult score for comparison. Error bars are 95%CI.

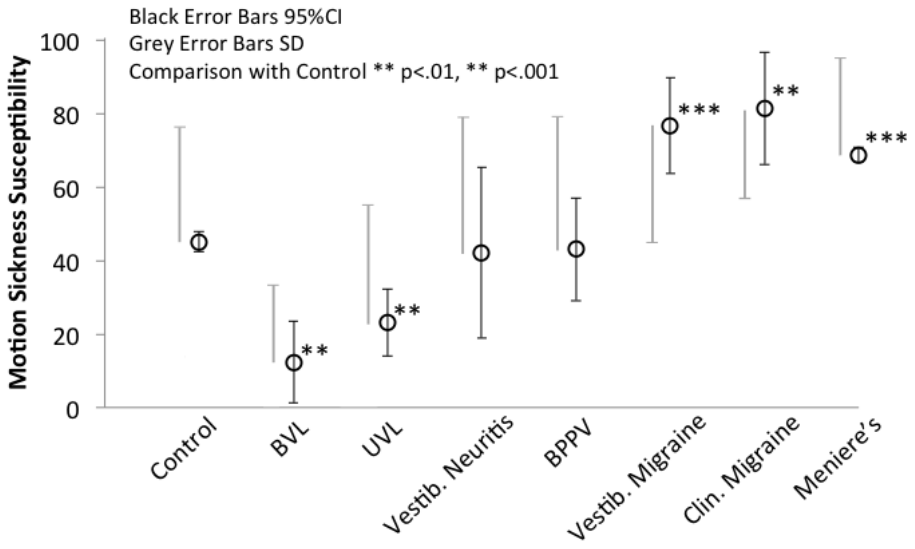

Figure 3. Motion sickness susceptibility questionnaire (MSSQ) adult scores are shown for this study and compared with other patient groups after onset of disease. MSSQ Percentile scores are used to enable comparison with previous data. Significances are comparisons of each patient group with age equivalent healthy controls. Both single standard deviation (SD) bars (grey) and 95%CI bars (black) are shown in the figure. The 95%CIs are smaller for controls and Meniere's disease as a consequence of larger numbers. BVL: bilateral vestibular loss; UVL: unilateral vestibular loss; BPPV: benign paroxysmal positional vertigo. See text for details. (Data source: combined from this study and others [3, 4]).

Tables

Table 1: Meniere's disease *versus* Controls, summary of responses (% prevalence or Mean±SD).

	Meniere's (n=751)	Controls (n=400)	Comparison *p* Value	95%CI of mean difference for continuous variables
Hearing loss	100%	18%	<.001	--
Medication use	73.1%	47.3%	<.001	--
Susceptibility to visual display dizziness	51.0%	14.6%	<.001	--
SWID "Social life" restricted/difficult	90.3%	18.0%	<.001	--
SWID "Family life" restricted/difficult	76.1%	17.7%	<.001	--
SWID "Travel" restricted/difficult	72.4%	20.9%	<.001	--
SWID "Work" restricted/difficult	72.0%	13.5%	<.001	--
SWID4 total score	3.1 ± 1.2	.7 ± 1.3	<.001	2.3 to 2.6
Frequency of headaches (range)	2.1 ± .8	1.8 ± .8	<.001	.23 to .43
Migraine total score (0-6)	3.3 ± 1.9	2.6 ± 2.0	<.001	.46 to .94
Experience of Syncope	39.2%	16.4%	<.001	--
MSA score (Child Mot Sick Suscep)	12.0 ± 8.9	11.5 ± 8.5	.394	-.63 to 1.6
MSB score (Adult Mot Sick Suscep)	11.6 ± 8.5	10.6 ± 8.0	.088	-.14 to 2.0
MSC score (Post Disease Mot Sick Suscep)	16.5 ± 8.2	10.6 ± 8.0	<.001	4.8 to 6.9

Table 2: Factor Analysis of main variables (see text for details).

Factor Analysis	**Factor**	
	1	**2**
Group (Meniere's/Controls)	-.89	
Age		-.57
Gender		.44
Hearing Loss	.88	
Medication use	.41	
Visual Display Dizziness (VDD)	.59	
Soc. Work Impact Dizziness (SWID4)	.84	
Syncope	.33	
Headaches		.73
Migraines		.73
Motion Sickness Susceptibility	.41	

Table Notes: For illustrative purposes loadings <.3 are not shown; Varimax rotation converged in three rotations.

Table 3: Unilateral Meniere's disease *versus* Bilateral Meniere's disease, summary of responses (% prevalence or Mean ± SD).

	Unilateral Meniere's (n=480)	Bilateral Meniere's (n=271)	Comparison *P*-Value	95%CI of mean difference for continuous variables
Age (years)	49.6 ± 10.9	50.0 ± 11.6	.623	-2.1 to 1.3
Gender (F:M)	403:77	226:45	.837	--
Disease duration (years)	9.8 ± 9.6	13.2 ± 11.4	<.001	-4.9 to -1.9
Age of disease onset (years)	39.8 ± 12.4	36.8 ± 12.6	.002	1.1 to 4.9
Vertigo attacks in previous one month	3.1 ± 5.6	4.5 ± 8.1	.004	-2.4 to .47
Vertigo attacks in previous six months	13.7 ± 30.4	21.1 ± 52.5	.014*	-13 to -1.5
Migraine total score (0-6)	3.2 ± 1.9	3.4 ± 1.8	.228	-.46 to .11
SWID4 total score	3.0 ± 1.2	3.3 ± 1.0	.002	-.42 to -.09
MSA score	11.7 ± 8.7	12.6 ± 9.2	.171	-2.4 to .43
MSB score	10.9 ± 8.1	12.8 ± 9.0	.007*	-3.2 to -.52
MSC score	15.5 ± 8.2	18.2 ± 7.8	<.001	-4.0 to -1.4

*Table notes: * Not significant following Bonferroni correction*

Appendix

Meniere's Disease Survey

Please note that:
Participation is entirely voluntary and you have the right to stop at any time without reason. All responses are confidential, no individuals will be identifiable from the report or any publications arising from it. All personal information you provide will be kept securely, and you have the right to ask for it to be destroyed. Only persons above 18 years of age should complete this survey.

I have read the above information and agree to participate (check on box) **No** **Yes**

Instructions: please write in your answer or check your choice as appropriate.

1. Please state your **Age** ..... Years
2. Please indicate your Gender (Sex) **Male** **Female**
3. What is your Meniere's disease diagnosis? **Unilateral** **Bilateral**
4. Do you have hearing loss from the disease? **No** **Yes**
5. How long have you suffered from Meniere's ? ..... Years
6. How many Vertigo Attacks (over 20 mins) have you had during the **last month**? ……..
7. How many Vertigo Attacks (over 20 mins) have you had in the **last six months**? …….
8. Are you taking medication for Meniere's? **No** **Yes**
9. If 'Yes', please state which medication(s) ……..
10. Has Meniere's disease impeded your use of visual interfaces (e.g., smart phones, computers, tablets)? **No** **Yes**
11. Have balance/ dizziness problems caused difficulties in your social life (e.g. restrictions on going out, planning holidays, etc) ? **No** **Yes**
12. Have balance/ dizziness problems caused difficulties in your family life? **No** **Yes**
13. Have balance/ dizziness problems restricted your ability to travel? (e.g. cannot ride bike, travel by car, plane) **No** **Yes**
14. Have balance/dizziness problems restricted or prevented you from working? **No** **Yes**

15. Are you susceptible to vasovagal syncope? **No** **Yes**

    Vasovagal syncope or presyncope is a medical condition in which you suddenly feel weak and faint, or actually faint and lose consciousness. It is always provoked by a particular circumstance such as stress, strong emotion, pain, prolonged upright position, hot environment or sight of blood. Other symptoms may include headache, nausea or vomiting, visual troubles, sensation of heat, cold sweating, facial pallor, lowered blood pressure and heart rate.

16. If 'Yes' to vasovagal syncope, please state facilitating factors, circumstances and symptoms: ……

17. Do you ever experienced loss of consciousness during vasovagal episodes? **No** **Yes**

18. Do you have **headaches** ? **never** **rarely** **sometimes** **often**

19. Are they **throbbing** ? **No** **Yes**

20. Are they on just **one side** of your head ? **No** **Yes**

21. During the headache are you **sensitive to light**? **No** **Yes**

22. During the headache are you **sensitive to sound**? **No** **Yes**

23. Does the headache make you feel **nauseated**? **No** **Yes**

24. Has a doctor called your headaches **migraine** ? **No** **Yes**

Motion Sickness Susceptibility

This questionnaire is designed to find out how susceptible to motion sickness you are, and what sorts of motion are most effective in causing that sickness. Sickness here means feeling queasy or nauseated or actually vomiting.

Your **CHILDHOOD** Experience (**before age12 years**), for each of the following types of transport or entertainment please indicate as a **CHILD** (before age 12), how often you **Felt Sick or Nauseated** (tick boxes):

	Not Applicable or Never Travelled	**Never Felt Sick**	**Rarely Felt Sick**	**Sometimes Felt Sick**	**Frequently Felt Sick**
Cars					
Buses or Coaches					
Trains					
Aircraft					
Small Boats					
Ships, e.g. Channel Ferries					
Swings in playgrounds					
Roundabouts in playgrounds					
Big Dippers, Funfair Rides					
	t	0	1	2	3

Before the onset of your Meniere's Disease: this concerns your **ADULT** experience **10 YEARS** previously. For each of the following types of transport or entertainment please indicate how often you **Felt Sick or Nauseated** (tick boxes):

	Not Applicable or Never Travelled	**Never Felt Sick**	**Rarely Felt Sick**	**Sometimes Felt Sick**	**Frequently Felt Sick**
Cars					
Buses or Coaches					
Trains					
Aircraft					
Small Boats					
Ships, e.g. Channel Ferries					
Swings in playgrounds					
Roundabouts in playgrounds					
Big Dippers, Funfair Rides					
	t	0	1	2	3

After the onset of your Meniere's Disease your **ADULT** experience over the **last 10 YEARS** approximately, for each of the following types of transport or entertainment please indicate how often you **Felt Sick or Nauseated** (tick boxes):

	Not Applicable or Never Travelled	**Never Felt Sick**	**Rarely Felt Sick**	**Sometimes Felt Sick**	**Frequently Felt Sick**
Cars					
Buses or Coaches					
Trains					
Aircraft					
Small Boats					
Ships, e.g. Channel Ferries					
Swings in playgrounds					
Roundabouts in playgrounds					
Big Dippers, Funfair Rides					
	t	0	1	2	3

Thank you for completing this survey