

# Relationships Among Common Vestibular Disorders Using the Dizziness Symptom Profile (DSP)

Richard A. Roberts, Ph.D.

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# Background

- Reported associations between two disorders
  - Vestibular Neuritis & BPPV
  - Migraine & BPPV
- Zhu et al. (2019) advanced this concept

# Zhu et al. (2019) literature review

- 18 epidemiologic reports (1 telephone; 1 patient questionnaire)
- Majority (almost 90%) of diagnosis data from physician perspective
- 3.7% had multiple diagnoses (1,263/33,968)
  - If 96.3% of patients do only have one diagnosis then why is this important?
  - Others suggest up to 35% of patients have >1 diagnosis
- Others have reported relationship between two disorders, but more than two is rarely discussed until Zhu et al. (2019)
- Vestibular migraine common co-occurring diagnosis



# Co-occurring Diagnoses Data

Core Diagnosis	Co-Occurring Diagnoses												
	BPPV		Meniere's Disease		PPPD		Superior Canal Dehiscence		Vestibular Migraine		Vestibular Neuritis		
	Zhu	DSP	Zhu	DSP	Zhu	DSP	Zhu	DSP	Zhu	DSP	Zhu	DSP	
BPPV			0.8 - 9.8							38 - 55		5.2	
Meniere's Disease	4 - 70								25 - 81				
PPPD	13 - 15		5						26				
Superior Canal Dehiscence									25 - 47				
Vestibular Migraine	42		25 - 38										
Vestibular Neuritis	9.8												

- Adapted from Zhu et al. (2019)

Research Article

# Multiple Co-Occurring Vestibular Disorders Identified Using the Dizziness Symptom Profile

Richard A. Roberts,<sup>a</sup>  Gary P. Jacobson,<sup>a</sup>  and Kelsey Hatton<sup>a</sup>

**Purpose:** The purpose of the current investigation was to determine the interrelations among vestibular disorders from a data set generated from the patient perspective as compared to previous data generated from the physician's perspective.

**Method:** The data for the current investigation originated from a previously published study describing the development of the Dizziness Symptom Profile (DSP; Jacobson et al., 2019). The DSP is a 31-item patient self-report tool designed to help primary care physicians in the development of a differential diagnosis using the patient's level of agreement with each dizziness and symptom-related statement. Responses to these items converge on common vestibular diagnoses and were previously found to agree with ear specialist differential diagnoses 70.3% of the time. Data were collected for 131 subjects ( $M_{age} = 56.7$  years, 72 women) seen for evaluation in a tertiary dizziness specialty clinic. For this study, the data were analyzed using descriptive statistics to determine the frequency of single diagnoses, multiple diagnoses, co-occurring diagnoses, and patterns of co-occurrence.

**Results:** Results indicated that 52.7% of patients endorsed a single vestibular diagnosis and 47.3% endorsed two or more vestibular diagnoses. Benign paroxysmal positional

vertigo (BPPV) and vestibular migraine were the most common single diagnoses and also the most common co-occurring diagnoses. As the number of diagnoses endorsed on the DSP increased, so did the percentage of time that BPPV and vestibular migraine would occur.

**Conclusions:** Results support and extend the work of others but using data generated from the perspective of the patient. A slight majority of patients endorsed a single disorder, but almost as many patients endorsed more than one vestibular diagnosis. BPPV and vestibular migraine were the most common single vestibular diagnoses and also the most common co-occurring vestibular diagnoses; vestibular migraine was more common when multiple diagnoses were endorsed. Results suggest it is common for patients to volunteer symptoms that cannot be explained by a single vestibular diagnosis. This finding is in agreement with physician-generated diagnosis data. Clinicians should consider the possibility of co-occurring diagnoses in complicated patients or in patients who are not responding optimally to management of a single vestibular disorder. The DSP is a tool that encourages clinicians to consider multiple co-occurring vestibular disorders as the source of patient complaints.

# Purpose

- Are interrelations among vestibular disorders reported by Zhu et al. and others from primarily a physician-perspective supported in a patient-generated data sample?
- Previously collected diagnosis data-set for Dizziness Symptom Profile (DSP) investigation
  - Patient perspective (prior to eval by AUD or visit with OTO)
  - Collected to compare patient-generated differential to physician-generated differential (**overall agreement was 70%**)
  - Data was *not* generated to investigate interrelations among vestibular disorders so less risk of investigator bias

# Dizziness Symptom Profile (DSP)

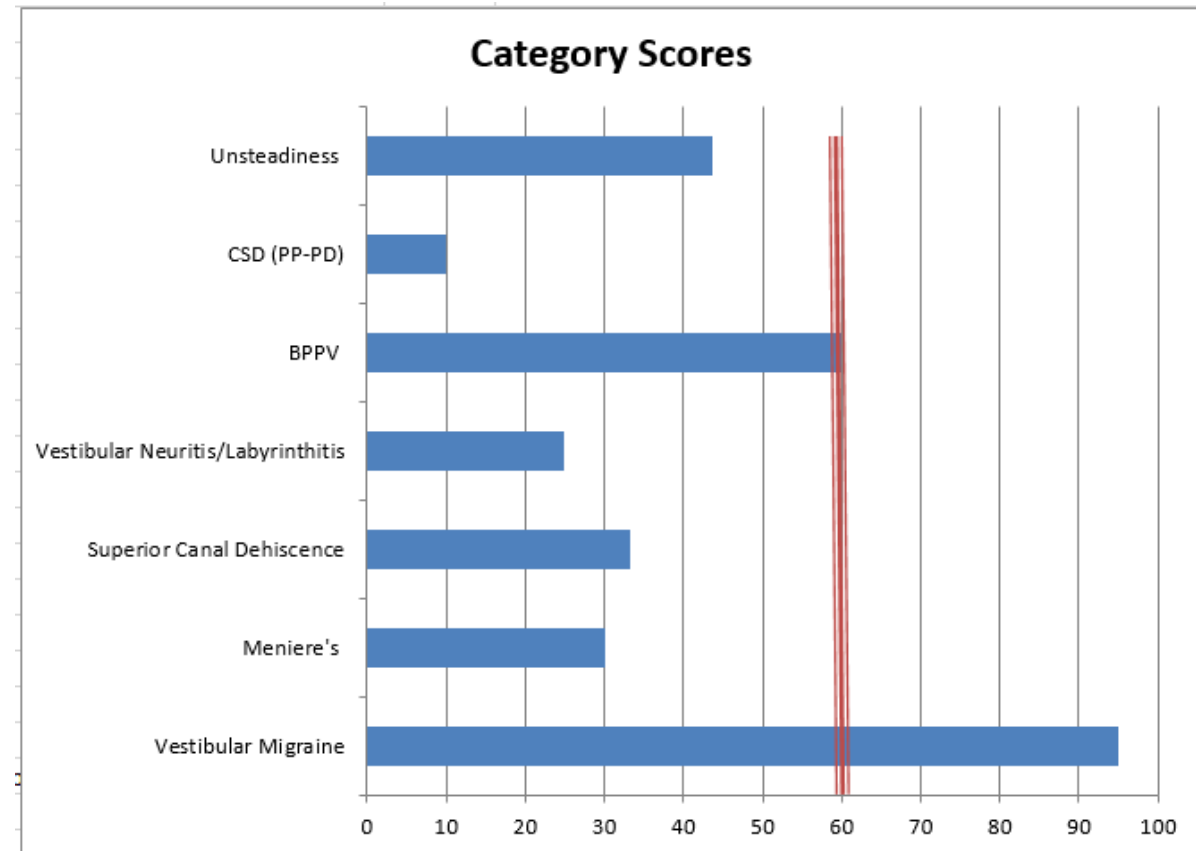
## Jacobson et al. (2019)

- 31-item self report questionnaire completed by patient
- Differential Diagnosis – Possible disorders that could be causing symptoms
- Factor analysis supports presence of 7 factors:
  1. Benign paroxysmal positional vertigo (BPPV)
  2. Meniere's disease
  3. Persistent postural-perceptual dizziness (PPPD)
  4. Superior canal dehiscence
  5. Vestibular migraine
  6. Vestibular neuritis
  - ~~7. Unspecified unsteadiness (*not* considered in current investigation)~~
- Investigation 3 indicated the differential diagnosis created by the DSP agreed with differential diagnosis created by the ear specialist **70%** of the time

## The Dizziness Symptom Profile

The following pages contain statements with which you can agree or disagree. To what extent do you personally agree or disagree with these statements in regards to your dizziness? Use the following scale: 0 = Strongly disagree, 1 = Disagree, 2 = Not sure, 3 = Agree, 4 = Strongly Agree

		Strongly Disagree		Not Sure		Strongly Agree
1	My dizziness is intense but only lasts for seconds to minutes.	0	1	2	3	4
2	I have had a single severe spell of spinning dizziness that lasted days or weeks.	0	1	2	3	4
3	I have spells where I get dizzy and also have irregular heartbeats (palpitations).	0	1	2	3	4
4	I hear my voice more loudly in one ear compared to the other.	0	1	2	3	4
5	I am unsure of my footing when I walk outside.	0	1	2	3	4
6	I get dizzy when I turn over in bed.	0	1	2	3	4
7	I get dizzy when I am in open spaces and have nothing to hold onto.	0	1	2	3	4
8	I have a roaring sound in one ear only before or during a dizziness attack.	0	1	2	3	4
9	I am depressed much of the time.	0	1	2	3	4
10	I lost hearing in one ear after an attack of spinning dizziness.	0	1	2	3	4
11	I had a big dizzy spell that lasted for days where I could not walk without falling over.	0	1	2	3	4
12	I get dizzy when I sneeze.	0	1	2	3	4
13	There are times when I get dizzy and also have a headache.	0	1	2	3	4
14	I get dizzy when I strain to lift something heavy.	0	1	2	3	4
15	I get short-lasting, spinning dizziness that happens when I bend down to pick something up.	0	1	2	3	4

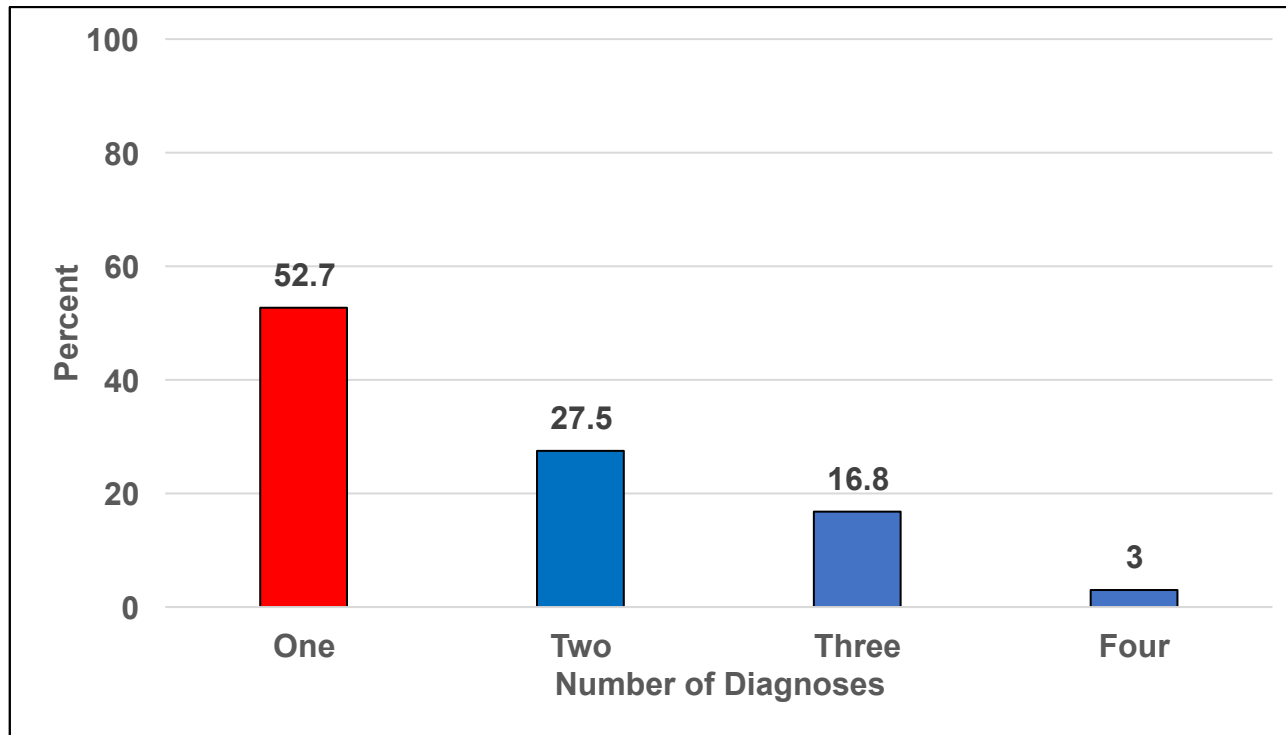




# Subjects

- Recruited from patients seen for evaluation of dizziness, vertigo, and/or unsteadiness at the Balance Disorders Laboratory at Vanderbilt University Medical Center
- **131** consented subjects
- Mean age = **56.7** years, (SD 16.07, 74 male)
- Only the DSP results were used in the current investigation
- Only specific vestibular diagnoses considered
- No restriction on number of diagnoses endorsed

# Results - Number of Diagnoses

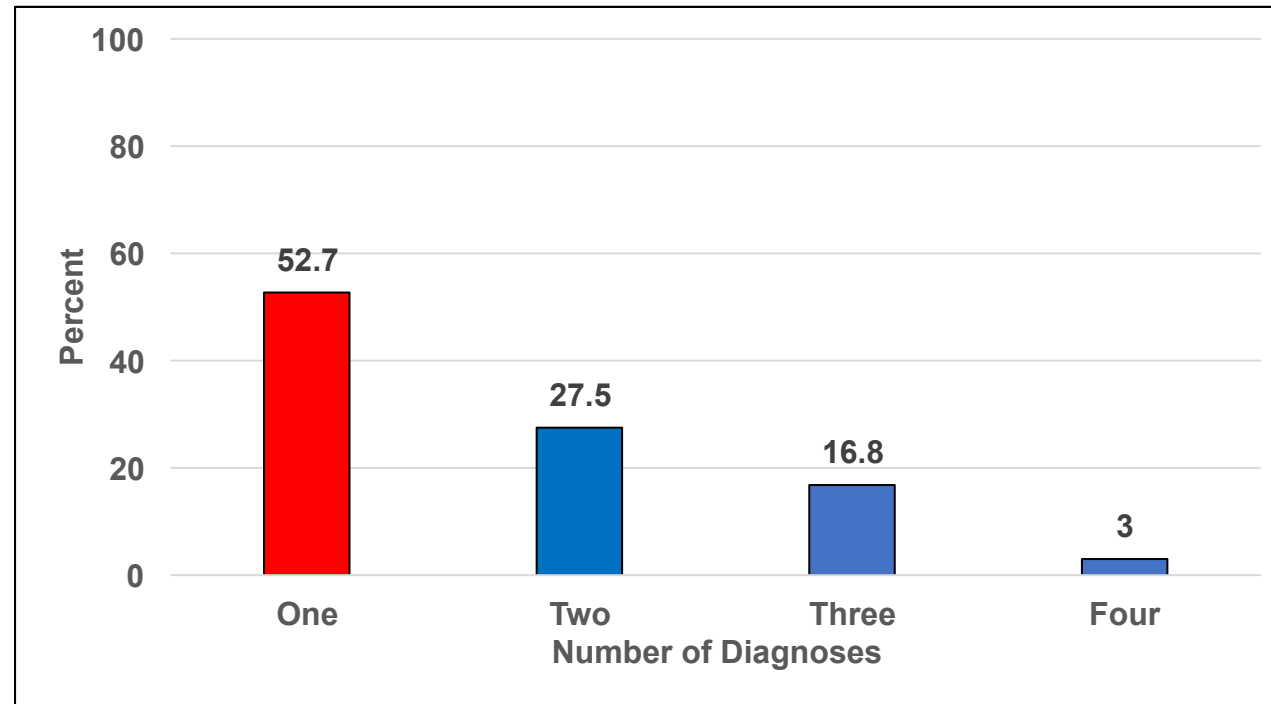


- 69 endorsed 1 diagnosis (53%)
- 62 (47%) endorsed 2 – 4
- no subject endorsed more than 4

## Discussion - Multiple Diagnoses

- Zhu et al. (2019) 3.7%
  - Range among other published data: 5.4 – 35.1%
  - Reconsider Zhu et al. data  $1,263/9,096 = \underline{13.9\%}$
- Our data (**47%**) higher than others
  - Uneri & Polat, (2008); van Leeuwen et al., (2017)  
30.1 – 35.1%
- Higher percentage in dizziness specialist centers

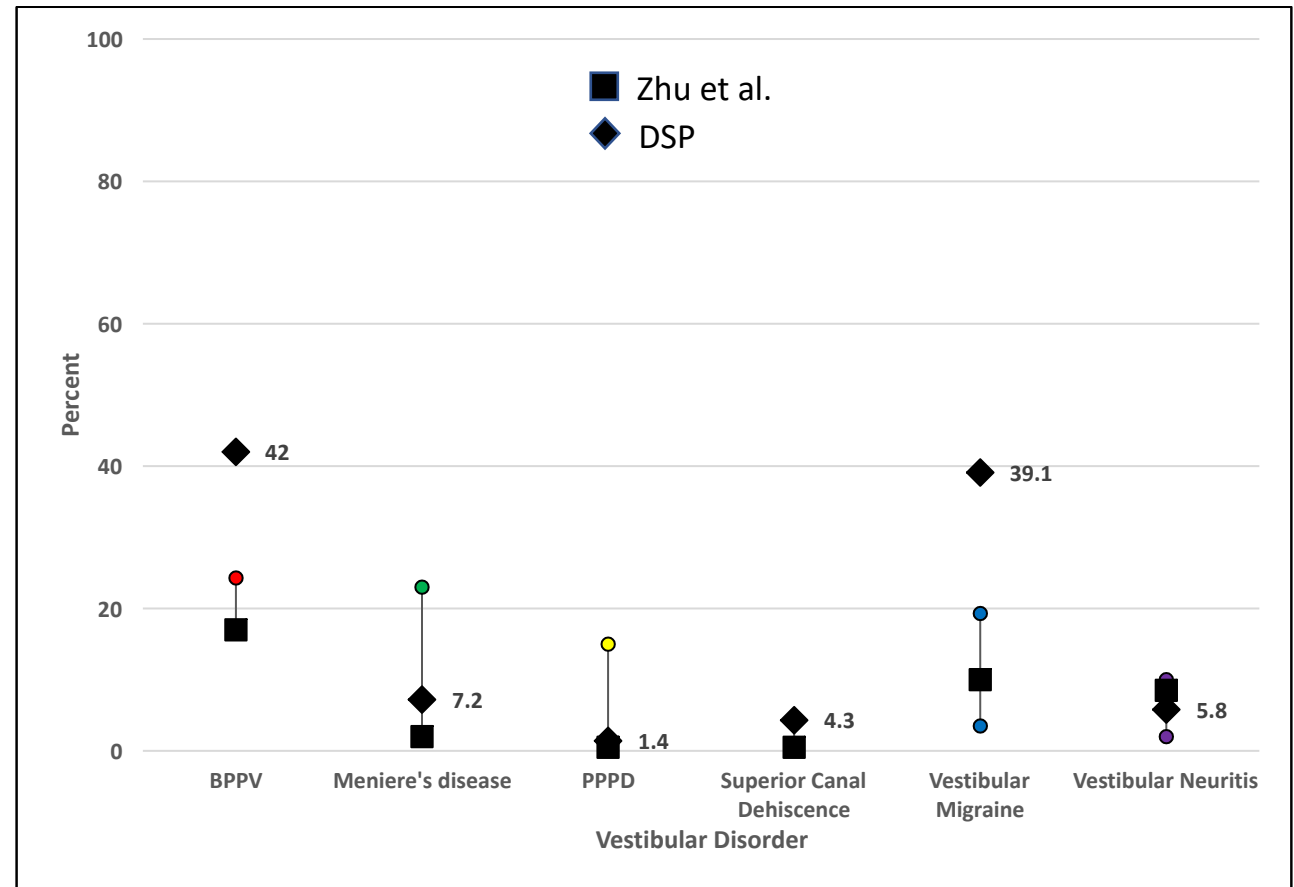
# Single Diagnosis Data



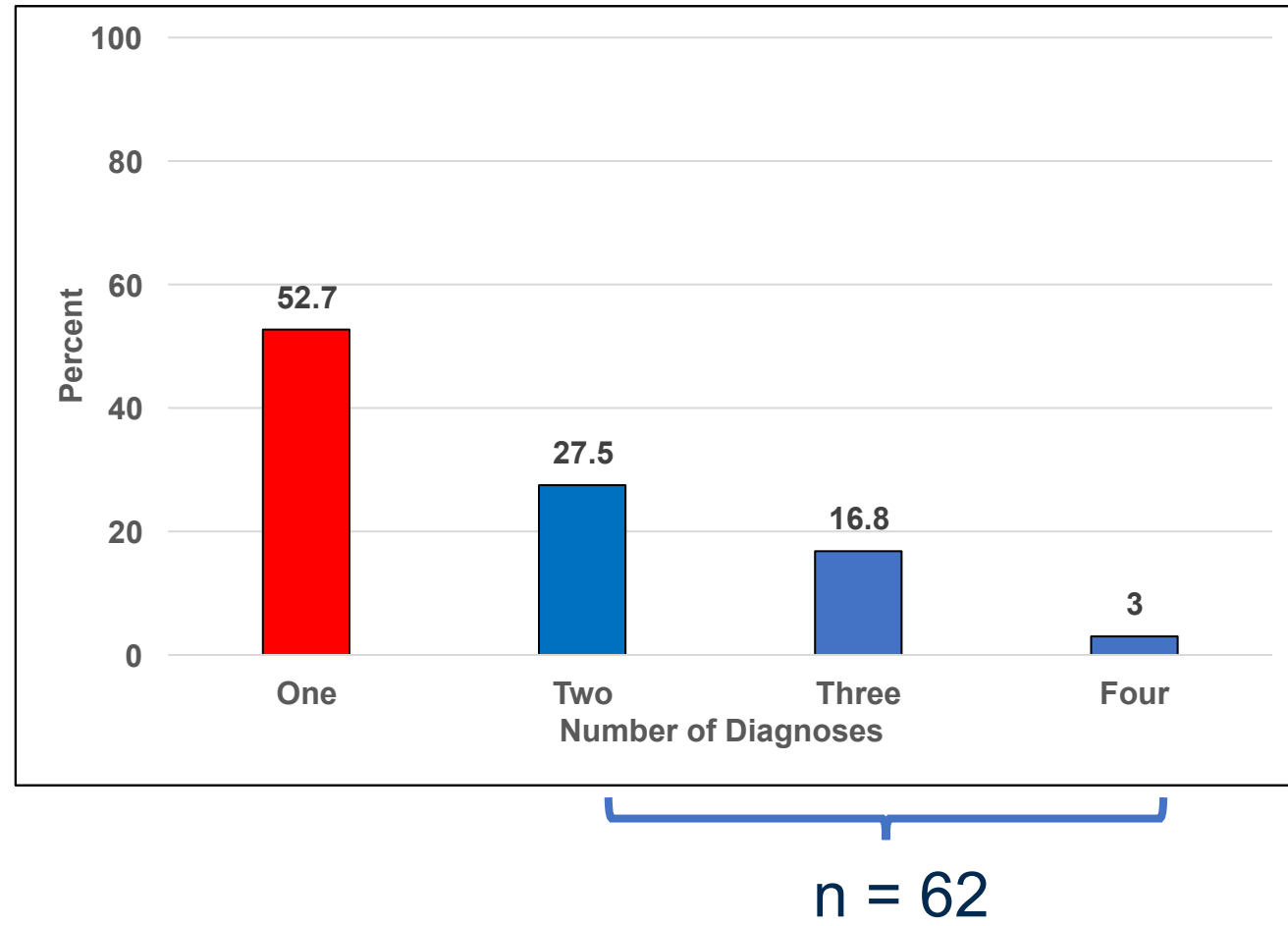
n = 69

# Single Diagnosis Data

- Agreement with Zhu et al. and others for Meniere's disease, PPPD, SCD, and Vestibular Neuritis
- High level of consistency between physician diagnosis data and data obtained from patient self-report for 2/3 of disorders
- Higher than all for BPPV and Vestibular Migraine (account for 81.1% of diagnoses)



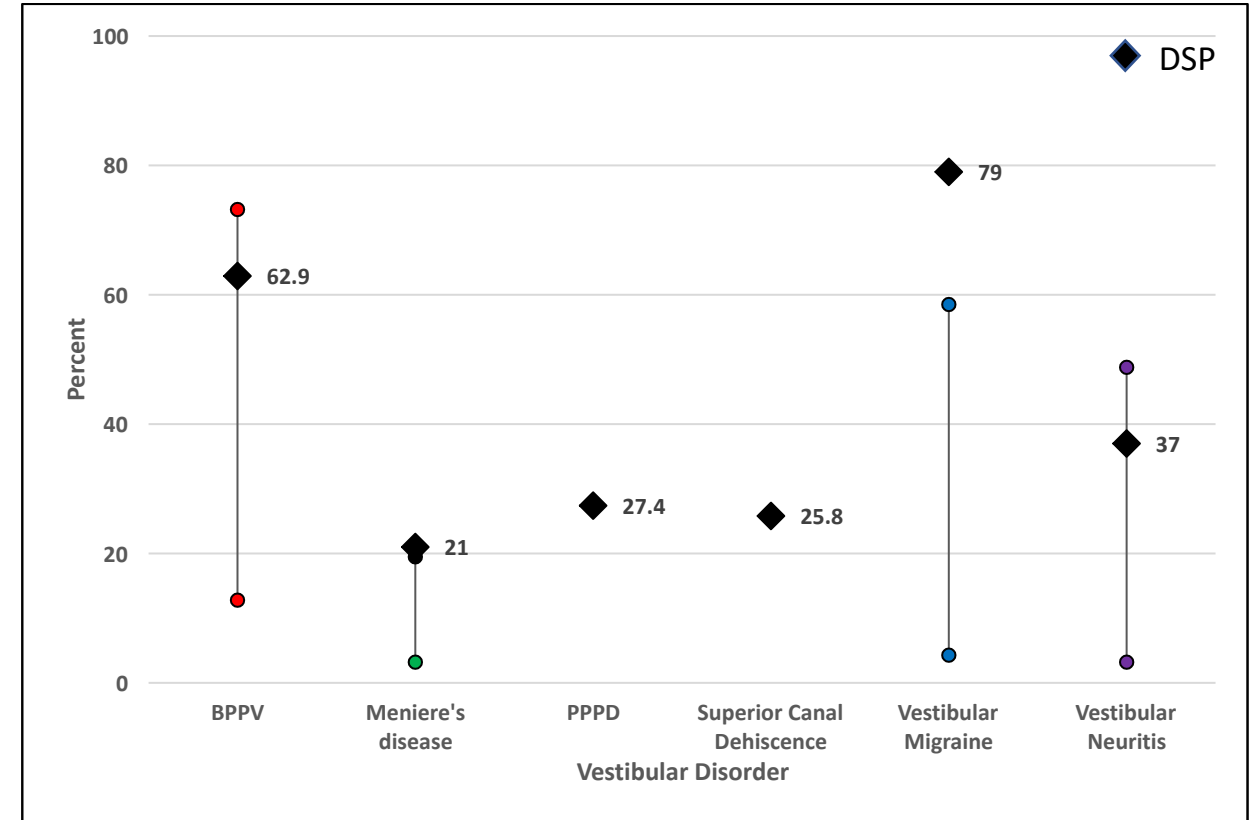
# Multiple Diagnoses Data



# Multiple Diagnoses Data

Comparison Studies/Subjects with Multiple Diagnoses	
Uneri & Polat, 2008	211 of 601
Roland et al, 2015	41 of 429
Muelleman et al, 2017	356 of 2,079
Van Leeuwen et al, 2017	187 of 621

- No comparison data for PPPD or SCD
- Vestibular Migraine and BPPV most common
- Data in agreement with literature except for Vestibular Migraine where we observed this disorder 20.5% more often than Roland et al. (2015).



# Co-occurring Diagnoses Data

Core Diagnosis	Co-Occurring Diagnoses												
	BPPV		Meniere's Disease		PPPD		Superior Canal Dehiscence		Vestibular Migraine		Vestibular Neuritis		
	Comp	DSP	Comp	DSP	Comp	DSP	Comp	DSP	Comp	DSP	Comp	DSP	
BPPV			0.8 - 9.8							38 - 55		5.2	
Meniere's Disease	4 - 70									25 - 81			
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Meniere's Disease	4 - 70	46.2				23.1		7.7	25 - 81	69.2		30.8
PPPD	13 - 15	41.2	5	23.5				17.6	26	47.1		29.4
Superior Canal Dehiscence		56.3		6.3		18.8			25 - 47	87.5		12.5
Vestibular Migraine	42	55.1	25 - 38	16.3		16.3		28.6				24.5
Vestibular Neuritis	9.8	47.8		21.7		21.7		8.7		56.5		

- Our data extends that reported by Zhu et al. to additional core and co-occurring diagnosis percentages for six common vestibular disorders

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- Agreement between Zhu et al. and DSP with core diagnosis of “Meniere’s Disease” and co-occurrence of “BPPV”, as well as with co-occurrence of “Vestibular Migraine”

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- We found fewer subjects with a core diagnosis of “Vestibular Migraine” and co-occurring diagnosis of “Meniere’s Disease.”

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- Most often, we found a higher percentage of co-occurring vestibular diagnoses than reported by Zhu et al.

# Co-occurring Diagnoses Data

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- Similar to Single Diagnosis and Multiple Diagnoses data, we saw the highest percentage of co-occurrence for “Vestibular Migraine” (47.1 – 87.5%) and “BPPV” (41.2 – 56.3%)
- **87.5%** of our subjects with “Superior Canal Dehiscence” also had “Vestibular Migraine”

# “Vestibular Migraine” and “BPPV”

	Most Common Patterns	Percentage (n = 131)
Two Diagnoses	BPPV + Vestibular Migraine	4.6%
Three Diagnoses	BPPV + Meniere’s Disease + Vestibular Migraine	1.5%
	BPPV + Vestibular Migraine + Vestibular Neuritis	1.5%
Four Diagnoses	BPPV + Meniere’s Disease + SCD + Vestibular Migraine	0.5%
	BPPV + PPPD + SCD + Vestibular Migraine	0.5%
	BPPV + SCD + Vestibular Migraine + Vestibular Neuritis	0.5%
	Meniere’s Disease + PPPD + Vestibular Migraine + Vestibular Neuritis	0.5%

- “Vestibular Migraine” and “BPPV” most frequently endorsed in common patterns of multiple diagnoses

# “Vestibular Migraine” and “BPPV”

	Most Common Patterns	Percentage (n = 195)
Two Diagnoses	BPPV + Vestibular Migraine	4.6%
Three Diagnoses	BPPV + Meniere’s Disease + Vestibular Migraine	1.5%
	BPPV + Vestibular Migraine + Vestibular Neuritis	1.5%
Four Diagnoses	BPPV + Meniere’s Disease + SCD + Vestibular Migraine	0.5%
	BPPV + PPPD + SCD + Vestibular Migraine	0.5%
	BPPV + SCD + Vestibular Migraine + Vestibular Neuritis	0.5%
	Meniere’s Disease + PPPD + Vestibular Migraine + Vestibular Neuritis	0.5%

- “Vestibular Migraine” endorsed in all of these

# “Vestibular Migraine” and “BPPV”

	Vestibular Migraine	BPPV
Single Diagnosis	39.1%	42%
Multiple Diagnoses	79%	62.9%
Two Diagnoses	55.6%	55.6%
Three Diagnoses	90.9%	72.7%
Four Diagnoses	100%	75%

- Similar rates of “Vestibular Migraine” and “BPPV” for subjects with Single Diagnosis and Two Diagnoses.



# “Vestibular Migraine” and “BPPV”

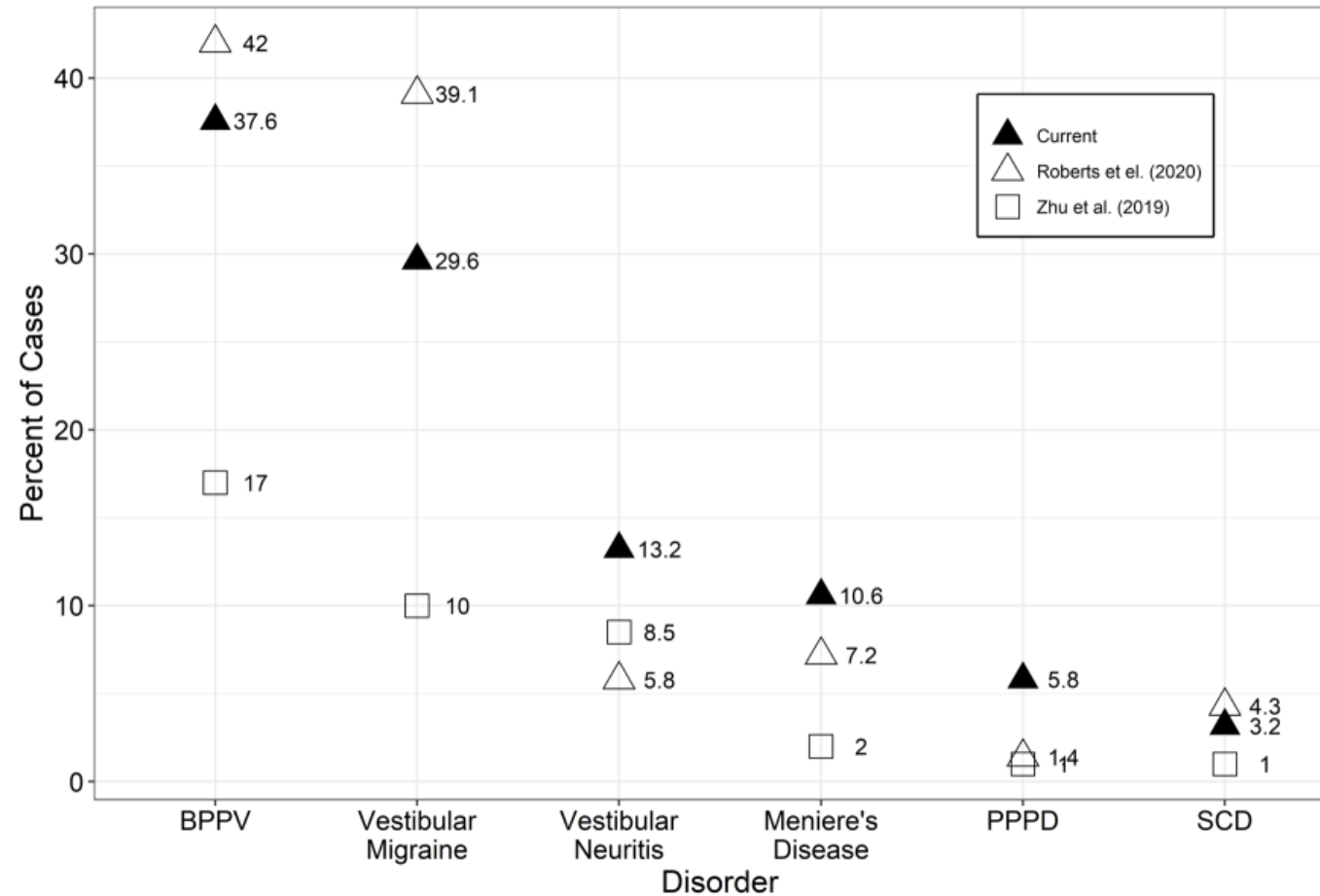
	Vestibular Migraine	BPPV
Single Diagnosis	39.1%	42%
Multiple Diagnoses	79%	62.9%
Two Diagnoses	55.6%	55.6%
Three Diagnoses	90.9%	72.7%
Four Diagnoses	100%	75%

- Higher rate for “Vestibular Migraine” in subjects with Multiple Diagnoses and, specifically, within the Three Diagnoses and Four Diagnoses groups.

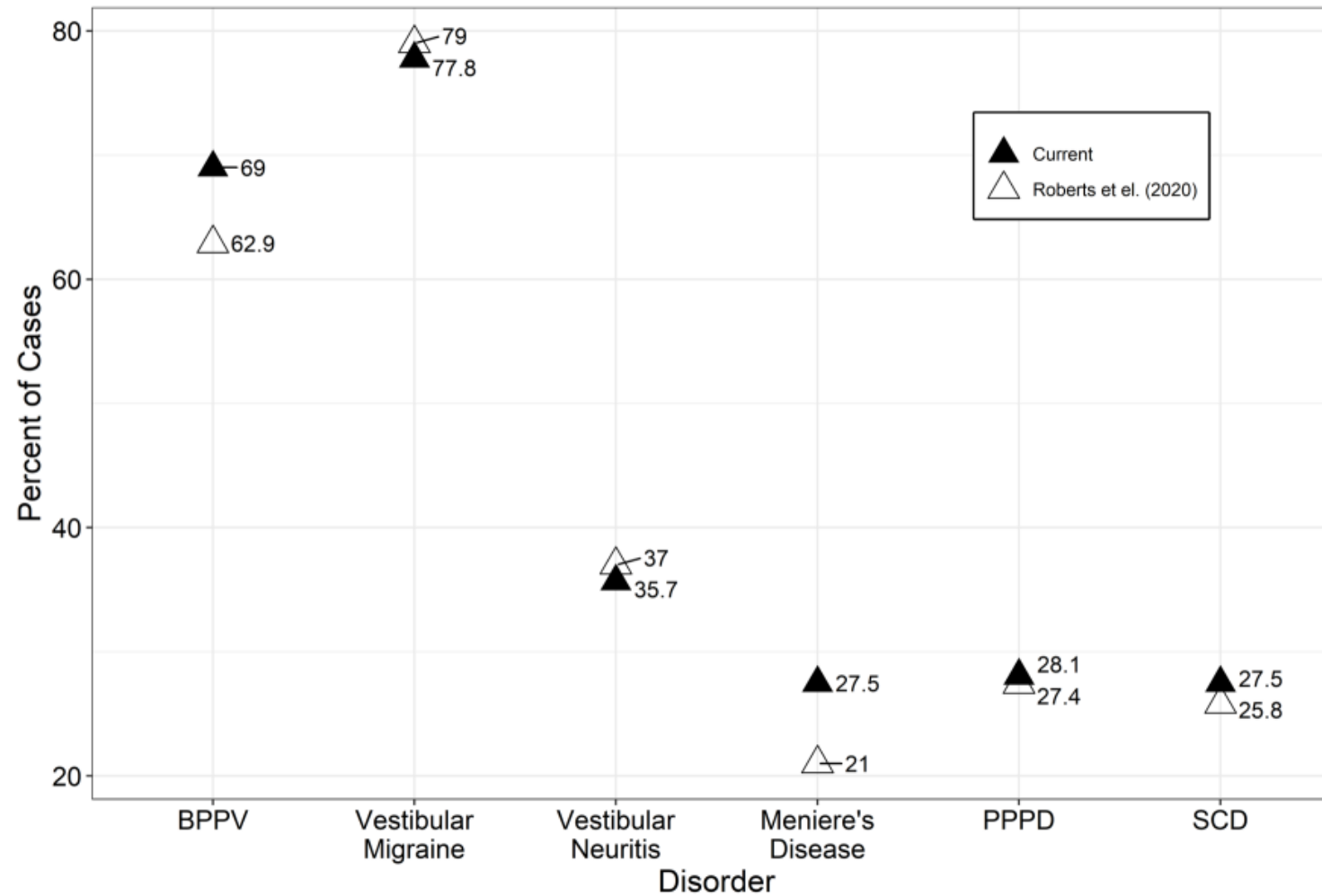
# Probabilities of Isolated and Co-occurring Vestibular Disorders

- Prospective Study
- DSP data collected from patients seen for evaluation of dizziness and/or imbalance
- Previous investigation only considered patients endorsing 1/6 vestibular disorders
- Current investigation included every patient regardless of endorsement or not
- n = 617; 56 years (18-90); 61% female

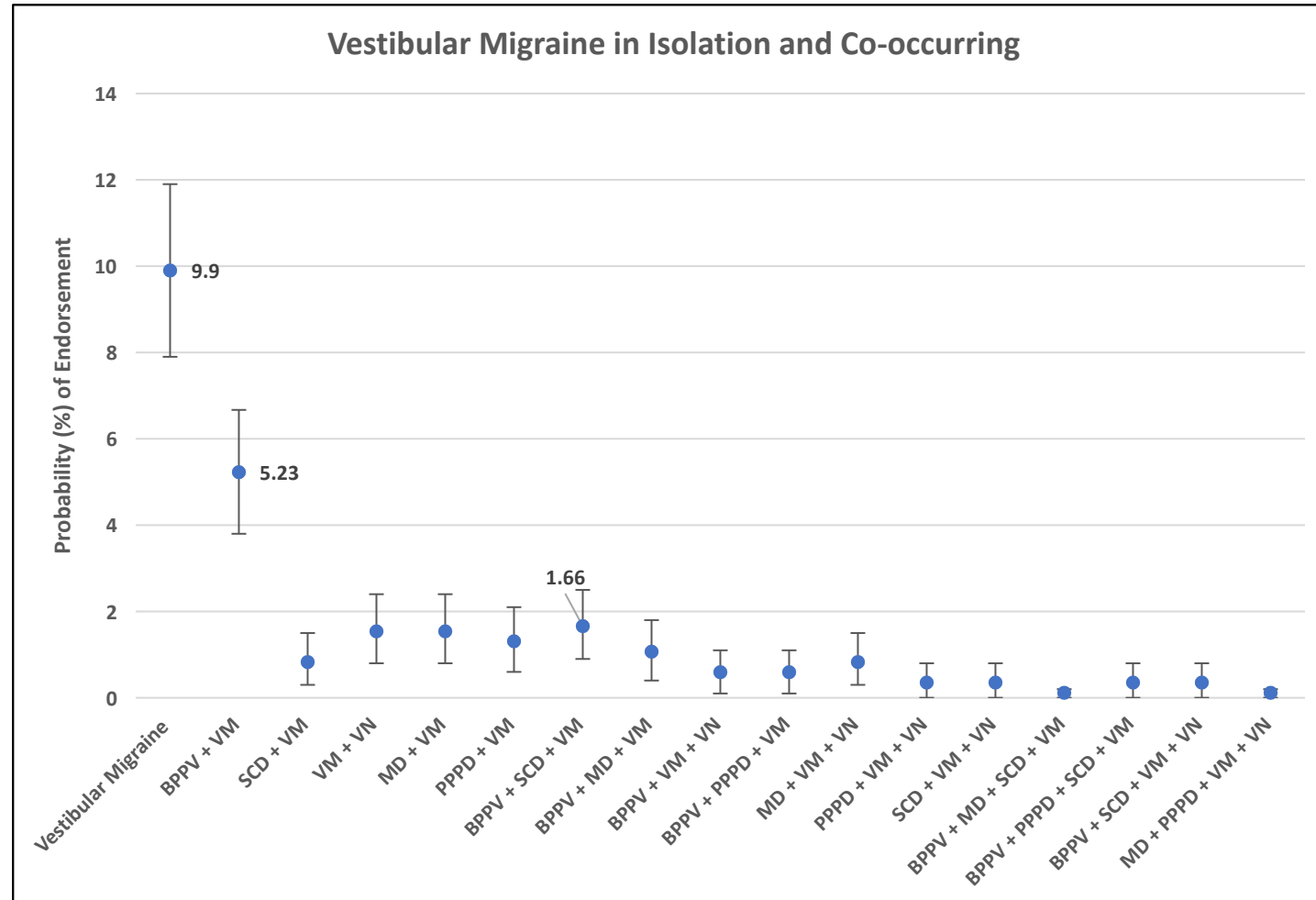
# Isolated Vestibular Disorders



# Multiple Vestibular Disorders



<b>ENDORSED OUTCOME(S)</b>	<b>CURRENT STUDY PROBABILITY IN PERCENT (HDI)</b>	<b>Strupp and Brandt (2013)</b>	<b>Roland et al. (2015)</b>	<b>Muelleman et al. (2017)</b>	<b>Van Leeuwen et al. (2017)</b>	<b>Uneri and Polat (2018)</b>
<b>None of the six disorders</b>	41.7 (38.4 – 45)	38.1	22.4	32.7	60	44.5
<b>Isolated</b>	30.6 (27.5 - 33.8)	61.9	77.6	30.8	40	32.5
<b>BPPV</b>	11.9 (9.7 - 14.1)	17.1	24.7	11.7	24.3	32.7
<b>VM</b>	9.9 (7.9 - 11.9)	11.4	24.7	11.9	3.5	11.7
<b>MD</b>	3 (1.9 - 4.1)	10.1	19	14.2	6.3	11.1
<b>VN</b>	3.5 (2.3 - 4.7)	8.3	9.2	1.2	6	--
<b>SCD</b>	1.1 (0.4 - 1.8)	--	--	2.4	--	--
<b>PPPD</b>	1.41 (0.7 - 2.2)	15	--	--	--	--
<b>Multiple</b>	27.7 (24.7 - 30.7)	--	9.4	10.6	30.1	23
<b>Two</b>	15.7 (13.2 - 18.2)	--	9.4	9.6	--	23
<b>BPPV + VM</b>	5.23 (3.8 – 6.7)	--	3	1.7	--	21.4
<b>BPPV + MD</b>	0.356 (0 – 0.8)	--	--	--	--	1.6
<b>VM + MD</b>	1.54 (0.8 – 2.4)	--	1.8	0.8	--	--
<b>BPPV + VN</b>	1.78 (0.9 – 2.7)	--	3.9	--	--	--
<b>VM + VN</b>	1.54 (0.8 – 2.4)	--	0.1	--	--	--



Bayesian Statistical Approach

# Summary

- Our results indicate **Vestibular Migraine** (along with BPPV) is one of the most common endorsed disorders, in isolation or co-occurring
- The importance of considering vestibular migraine was recognized by Zhu et al. (2019)
  - Advocated screening for migraine symptoms during initial and follow-up visits with all patients presenting with a complaint of dizziness.
- There is a 31% probability for isolated vestibular disorder and a 28% probability for two or more vestibular disorders for patients seen in tertiary care specialty clinics.
- Managing all disorders sooner should result in improved patient HRQOL and also help decrease healthcare costs.

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