



Benign Paroxysmal Positional Vertigo

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Benign paroxysmal positional vertigo (BPPV) is the most common diagnosis of patients experiencing vertigo.¹ Typically, when patients experience vertigo they report dizziness, a challenging symptom to manage in athletic healthcare. Patients may experience a high level of disability, and clinicians could experience a difficult time in diagnosing the cause of the dizziness. However, clinical decision making is aided by distinguishing dizziness from vertigo. *A symptom of true vertigo must include the patient experiencing a spinning sensation*, either they are spinning in their environment or their environment is spinning around them. Differentiating dizziness from vertigo is the first step towards diagnosing BPPV. This article will serve as a guide for athletic trainers in diagnosing BPPV in the clinical setting and provide resources to inform treatment decisions.

Pathophysiology of BPPV

The bony labyrinth of the inner ear is comprised of the cochlea, the vestibule, and the semicircular canals. The utricle and saccule, made of a membranous labyrinth of small structures known as otoliths, are housed within the vestibule. The otoliths are responsible for the sensation of linear acceleration and gravitational changes.² BPPV occurs as a result of the otoliths becoming dislodged and migrating into the semicircular canals (canalithiasis), or attaching to small hair cells found at the end of the canals known as cupula (cupulolithiasis).^{1,2} This displacement of the otoliths allows freedom of movement not otherwise found within the otolith organs making them more susceptible to changes in position relative to gravity. Thus, the individual's vestibular system will receive increased stimulation resulting in an abnormal sensation of movement, or vertigo. The cause of BPPV can be idiopathic; however, head trauma, inner ear infections such as labyrinthitis, and vascular compromise of the vestibular artery may also lead to BPPV.²

Diagnosis of BPPV – Vertical Canals

The diagnosis of BPPV begins with identification of the hallmark symptoms within a patient's history. These are:

- Vertigo
- Position dependent
- Sudden onset

Patients suffering from BPPV will report symptoms that have a sudden onset resulting in vertigo that directly follows changes in position relative to gravity. It is important to note that the positional change must be relative to gravity, as other conditions such as orthostatic hypotension may present with similar symptoms. A patient with BPPV could experience symptoms with changes of position as simple as rolling over in bed if it results in a change in orientation of the semicircular canals relative to gravity.



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Following the history, physical exam is utilized to confirm a diagnosis of BPPV. It is important to note that prior to performing any physical exam procedures outlined in this paper, the patient should be cleared of relative contraindications. A list of these include, but are not limited to, cervical spine instability, vertebral basilar insufficiency, patient discomfort with testing position, etc. The test utilized clinically to diagnose BPPV is known as the Dix-Hallpike maneuver and consists of the clinician rotating the patient's head 45° to the right or the left and quickly moving them from seated to lying with their cervical spine in extension (see visual). In this position the clinician will note symptoms experienced by the patient and watch their eyes for nystagmus.^{1,2}

Nystagmus is an involuntary oscillation of the eyes that consists of a fast and a slow component, and is classified by the direction of the fast component (e.g. fast component moving superiorly is classified as upbeating). The terminology to classify nystagmus is directional, in relation to the patient's anatomic position. The direction and duration of the nystagmus in conjunction with the direction the patient's head is turned will inform the clinician as to the specific location and cause of the BPPV.^{1,2} Please refer to this chart for clinical decision making regarding nystagmus.

	<u>Observed</u>	<u>Meaning</u>
Nystagmus during Dix-Hallpike Maneuver	Right torsional nystagmus	Right sided cause
	Left torsional nystagmus	Left sided cause
	Upbeating nystagmus	Posterior canal affected
	Downbeating nystagmus	Anterior canal affected
	Duration > 60 seconds	Cupulolithiasis
	Duration < 60 seconds	Canalithiasis
Nystagmus during Roll Test	Geotropic	Canalithiasis
	Ageotropic	Cupulolithiasis

The majority of BPPV is caused by otoliths within the posterior semicircular canals and the clinician should expect to see right or left (based upon side affected) torsional, upbeating nystagmus that lasts for less than 60 seconds in response to the Dix-Hallpike maneuver.^{1,2}

Diagnosis of BPPV – Horizontal Canals

The pathophysiology of BPPV as a result of horizontal canalithiasis or cupulolithiasis is the same as the vertical canals, however, due to anatomical location the Dix-Hallpike maneuver does not elicit a symptom response. When BPPV is suspected but the Dix-Hallpike is negative, a clinician should perform the roll test. This test consists of the clinician positioning the patient in supine and quickly rotating their head 90 degrees to the right or the left.² Nystagmus in this position is classified as either geotropic, meaning towards the ground and indicating canalithiasis, or ageotropic, meaning away from the ground and indicating cupulolithiasis.



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Treatment for BPPV

Due to the fact that the majority of BPPV involve canalithiasis of the posterior canal, this article will address treatment for that condition. Please see the references below for further reading about the treatment for cupulolithiasis or BPPV caused by the horizontal canals.

Treatment begins in the same position as the positive Dix-Hallpike test. The clinician will hold the patient in that position for approximately 60 seconds, or until the symptoms completely subside. This is followed by a series of deliberate movements aimed at repositioning the otoliths. Please see the accompanying visual for each subsequent treatment position. It is important for the clinician to remember that the movements should be quick and deliberate, cervical spine extension must be maintained when rotating from right to left (or vice versa), and the patient should expect to feel symptoms.^{1,2}

Return to Play Considerations

Often BPPV is a self-limiting condition that will resolve spontaneously if left untreated. The otoliths that have migrated to the canals or the cupula will usually resorb after a period of a few hours to a few days. However, patients usually suffer from significant disability while symptomatic. Evidence suggests that otolith repositioning maneuvers are beneficial in decreasing symptoms and improve patient prognosis.¹⁻³ Further, it is recommended that patients sit quietly for approximately 20 minutes to monitor for symptoms following application of repositioning maneuvers. Clinical decisions regarding return to contact or collision sports should be made on a case by case basis after thorough exam.

1. Kim JS, Zee DS. Clinical practice. Benign paroxysmal positional vertigo. *N Engl J Med*. 2014;370(12):1138-1147.
2. Lee SH, Kim JS. Benign paroxysmal positional vertigo. *J Clin Neurol*. 2010;6(2):51-63.
3. Hilton MP, Pinder DK. The Epley (canalith repositioning) manoeuvre for benign paroxysmal positional vertigo. *Cochrane Database Syst Rev*. 2014;12:CD003162.