The relationship between the Activities-specific Balance Confidence Scale and the Dynamic Gait Index in peripheral vestibular dysfunction

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ABSTRACT **Background and Purpose**. *People with vestibular dysfunction experience dizziness, vertigo and postural instability. The persistence of these symptoms may result in decreased balance confidence. The purpose of the present study was to examine the relationship between decreased balance confidence and gait dysfunction in patients with unilateral peripheral vestibular dysfunction.* **Method**. *A retrospective review of 137 charts with the Activities-specific Balance Confidence (ABC) Scale and the Dynamic Gait Index (DGI) scores was completed. Spearman rank–order correlation analysis was performed of the total sample, by age group and by degree of vestibular weakness.* **Results**. *A moderate correlation of* $r = 0.58$ ($p<0.001$) *was found between the ABC Scale score and the DGI score in the total sample. Those with mild or moderate vestibular weakness had a correlation of* $r = 0.72$ ($p<0.001$) *between the ABC Scale score and the DGI score, compared with a correlation of* $r = 0.48$ *in those with severe or total vestibular weakness.* **Conclusions**. *Decreased balance confidence and increased fall risk are critical issues for people with vestibular dysfunction. The effects of aging did not have a significant impact on the relationship. The correlation between balance confidence and gait dysfunction was stronger in those with mild or moderate vestibular weakness, although those with severe or total weakness were more disabled by their vestibular symptoms.*

Key words: balance confidence, dizziness, gait, vestibular

INTRODUCTION

People with vestibular dysfunction experience signs and symptoms of dizziness, vertigo and postural instability. Depending on the vestibular disorder, these signs and symptoms may be acute, episodic in nature or chronic. If the symptoms are persistent, the combination of problems may lead to a decrease in balance confidence (Powell and Myers 1995; Whitney et al., 1999), defined as a person's self-confidence in his or her ability to not fall while performing an identified activity. Changes in gait (Gill-Body et al., 2000; Whitney et al., 2000a) and, ultimately, reductions in activity participation (Jacobson and Newman, 1990; Boult et al., 1991; Cohen, 1992) may also result from these ongoing signs and symptoms of vestibular dysfunction. The purpose of the present study was to examine the relationship between decreased balance confidence and gait dysfunction in people with unilateral peripheral vestibular dysfunction.

Unilateral peripheral vestibular dysfunction may encompass a variety of diagnoses, such as unilateral vestibular hypofunction, vestibular neuritis or Ménière's disease. These diagnoses will typically demonstrate unilateral weakness of the vestibular system, spontaneous or pathological nystagmus and accompanying vestibular symptoms. Benign paroxysmal positional vertigo (BPPV) is included in this categorization as it is a disorder of the peripheral structures of the inner ear, generally occurs unilaterally and presents with provoked vertigo (Baloh and Halmagyi, 1996).

Health professionals who treat vestibular disorders have sought an objective assessment measure whose results correlate with patients' reports of the severity of imbalance and vertigo. Caloric testing provides the best measure of individual peripheral vestibular response by comparison of the right ear with the left ear to determine a 'reduced vestibular response'. A reduced vestibular response is indicative of a peripheral vestibular disorder; however, individuals with BPPV generally exhibit normal caloric responses (Baloh and Halmagyi, 1996). In studies that have examined the relationship between the results of caloric testing and the degree of disability and symptoms, the results have not been consistent. Previous research by Jacobson and Newman (1990), Jacobson et al. (1991) and Brookes et al. (1994) identified that there was no significant correlation between the results of caloric testing, self-perceived handicap and severity of vertigo or imbalance. Bamiou et al. (1999) compared individuals with total canal paresis (>60% weakness) with those with partial canal paresis (25–60% weakness) and found dizziness and disability to be more severe in those with partial canal paresis. Balance confidence has not been examined within groups of people with defined peripheral vestibular weakness.

Balance confidence is a psychological component of balance-related behaviour which looks not only at a person's true capability to perform a balance task, but also at the level of confidence that influences the behaviour (Tennstedt et al., 1998). The level of confidence that a person has in performing a self-care task without falling is strongly correlated with actual performance of that task (Myers et al., 1996). Successful performance of tasks exerted the strongest influence on balance confidence, and people tend to avoid behaviours or situations for which they distrust their capabilities (Myers et al., 1996). Decreased balance confidence has been examined in community-dwelling older adults and was found to be associated with deteriorating quality of life, impaired function and loss of independence (Cumming et al., 2000).

The vestibular system undergoes normal changes with aging (Sloane et al., 1989; Lopez et al., 1997) in addition to the pathological changes that occur with various vestibular disorders. With increasing age, significant cell loss has been noted in the vestibular system and a decrease in the visual–vestibulo–ocular reflex (VOR) gain is noted, evidenced by caloric testing in younger adults, which indicates higher frequency and larger amplitude ocular motor responses when compared with people aged more than 60 (Paige, 1992). These vestibular system changes with aging, in addition to visual and somatosensory system changes that occur with age (Spooner, 1980; Brocklehurst et al., 1982; Stelmach and Worringham, 1985; Munoz et al., 2000), may make compensating for a vestibular disorder more difficult. The older adult may be able to maintain adequate function with a slight decrease in vestibular function, although if this is compounded by decreases in visual or somatosensory function, the ability of the older adult to compensate is further compromised (Sloane et al., 1989). The impact of age on the relationship between balance confidence and gait dysfunction has recently been reported in people with peripheral vestibular dysfunction. Cohen and Kimball (2004) and Hall et al. (2004) recently reported that age and length of symptoms were not factors in the recovery of patients with unilateral vestibular loss.

The Activities-specific Balance Confidence (ABC) Scale, developed by Powell and Myers (1995) to assess balance confidence in older adults, uses 16 situation-specific descriptors of activities necessary to independent living. The items were combined with a 0–100% response continuum into a self-report questionnaire that asks, ‘How confident are you that you will not lose your balance or become unsteady when you …?’. Myers et al. (1998) identified characteristics of clients, based on their ABC Scale scores, in a group of community-dwelling older adults and found that ABC Scale scores of less than 50 indicated a low level of physical functioning, which was characteristic of home care clients. ABC Scale scores of more than 50 and less than 80 indicated a moderate level of physical functioning, typical of older adults in a retirement home setting or people with chronic health conditions. Scores on the ABC Scale of more than 80 were indicative of high functioning, usually physically active, older adults (Myers et al., 1998). Lajoie and Gallagher (2004) recently suggested that with an ABC Scale cut-off score of 67%, we can accurately classify people who fall 84% of the time.

This tool demonstrated strong test–retest reliability ($r = 0.92$; $p<0.001$) and high internal consistency with Cronbach’s alpha (0.96) when tested in community-dwelling older adults (Powell and Myers, 1995). Moderate validity of the ABC Scale has been found in individuals with vestibular dysfunction (Whitney et al., 1999), and responsiveness to therapeutic intervention was found in those with migraine-related vestibulopathy (Whitney et al., 2000a). The ABC Scale is easy to administer and score, and it captures aspects of dynamic balance found in normal everyday activities.

Shumway-Cook and Woollacott (1995) developed the Dynamic Gait Index (DGI) to evaluate the ability of older adults to adapt their gait to changes in various task demands. It is a test of gait-related tasks with a description of gait or balance characteristics provided to guide the rater’s scoring as part of the initial assessment. The scoring is done on a four-point (0–3) response system of no, minimal, moderate or severe impairment, yielding a maximum score of 24. Scores of 19/24 or less have been found to indicate fall risk status in older adults (Shumway-Cook et al., 1997) and people with vestibular dysfunction (Whitney et al., 2000a).

Strong inter-rater ($r = 0.96$) and test–retest reliability ($r = 0.98$) were noted in community-dwelling older adults by use of the DGI. Wrisley et al. (2003) reported moderate ($k = 0.64$) inter-reliability of the DGI in patients with peripheral vestibular dysfunction. In addition to being a good indicator of fall status, the DGI was found to have concurrent validity with the Berg Balance Scale in individuals with vestibular dysfunction (Whitney et al., 2003). In contrast to the Berg Balance Scale, which assesses balance in the seated and standing positions, the DGI was selected for the present study because the tasks were consistent with the activities assessed by the ABC Scale. The tasks included items such as gait with velocity changes, head turns or walking around obstacles — items characteristic of those encountered in daily life. Recently, Hall et al. (2004) reported changes in DGI scores over the course of rehabilitation in people with unilateral vestibular loss.

In clinical practice, the physiotherapist takes the components of the examination and weighs their importance to provide a prognosis for the patient and to plan appropriate interventions. If the correlation is very high, it might only be necessary to have the patient complete the paper and pencil test as a determinant of fall risk. Therefore, the purpose of the present study was to examine the relationship between decreased perceived balance confidence and gait dysfunction, in people with unilateral peripheral vestibular dysfunction, via commonly used assessment tools, the ABC Scale and the DGI scores, in order to provide additional data for clinical decision-making. The effects of age on balance confidence and gait dysfunction in those with mild or moderate and severe or total peripheral vestibular weakness were also studied. A moderate correlation between balance confidence and gait dysfunction was hypothesized, with a stronger correlation anticipated in the older patient groups. A difference in the correlation of balance confidence and gait dysfunction was not expected between the mild or moderate weakness group and the severe or total weakness group.

METHOD

Subjects

A convenience sample of vestibular physical therapy charts completed between 1996 and 1999 at the Centers for Rehab Services of the University of Pittsburgh Medical Center in Pittsburgh, Pennsylvania, USA was reviewed, following Institutional Review Board approval. Subjects (n = 137; 87 females, 50 males) were adult outpatients diagnosed with a peripheral vestibular disorder. Of this sample, the mean age was 60.8 years (range 24–87 years; standard deviation (SD) 15.5 years) and mean length of symptoms was 30.6 months (range 1–564 months; median 6 months). Fifty-eight per cent of the patients had been examined and were referred by a neurologist who specializes in otology. Patients presented with diagnoses of unilateral peripheral hypofunction or BPPV. Diagnoses of bilateral vestibular dysfunction, central vestibular and combined central and peripheral vestibular dysfunctions were excluded.

Procedure

After physician referral, the physiotherapist completed an initial examination, which included the patient's self-report on the ABC Scale, where each subject completed the ABC Scale by selecting one of the percentage points (10% increments) from 0% to 100% to indicate his or her level of confidence in doing the activity. The percentages for the 16 items were averaged for a resulting total ABC Scale score. The physiotherapist scored the DGI, through observation of the subject's gait and balance, by assigning a score of 0–4 on each of the eight criteria of the DGI. The scores were summed for a total DGI score of a possible 24 points. The three physiotherapists who collected data, in addition to the second author, were trained by the second author. In order to collect data, the physiotherapist had to agree ±1 point on five consecutive patients with the second author (Whitney et al., 2003). Data were gathered from complete charts, which included the total ABC Scale score and the DGI score, and the degree of peripheral weakness was determined by caloric testing (Table 1). Caloric weakness was determined by use of Jongkees' formula (Baloh and Halmagyi, 1996). A reduced response of >25% (asymmetry in the slow phase eye velocity between both ears) was considered significant with the bithermal caloric testing (Baloh and Halmagyi, 1996). The patients' diagnoses and degree of caloric weakness are detailed in Table 2.

Additional diagnostic testing was completed and available in the medical record. Forty-two per cent of subjects had oculomotor and positional testing, 38% had rotational vestibular testing and 13% completed dynamic posturography.

Statistical analysis

Data were analysed using the GB-STAT statistical package (Somers, 1995). The non-parametric Spearman's rank–order correlation coefficient was used to analyse the data of all subjects, by the degree of peripheral weakness, and the data were grouped by age intervals.

Differences in the ABC Scale data, by degree of peripheral weakness and by age, were examined by use of the Student's *t*-test. Differences in the DGI data, by degree of peripheral weakness and by age, were

TABLE 1: Range of the Activities-specific Balance Confidence (ABC) scores and Dynamic Gait Index (DGI) scores by degree of caloric weakness

*Caloric test results (*n*)*	*Range of ABC scores (mean ± SD)*	*Range of DGI scores (mean ± SD)*
Mild or moderate weakness (*n* = 33)	4–100 (54 ± 28)	1–24 (17 ± 7)
Severe or total weakness (*n* = 31)	1–90 (47 ± 23)	3–24 (15 ± 6)
Normal caloric test (*n* = 73)	0–100 (63 ± 25)	7–24 (18 ± 5)

TABLE 2: Diagnosis and caloric test results of 137 people with peripheral vestibular diagnoses

Diagnosis test	*Normal caloric weakness (%)*	*Mild or moderate weakness (25–60%)*	*Severe or total weakness (n; % of total) (> 60%)*
All subjects	73 (53)	33 (24)	31 (22) (*n* = 137)
Unilateral peripheral	47 (34)	28 (20)	26 (19) hypofunction (*n* = 101)
BPPV	26 (19)	5 (4)	5 (4) (*n* = 36; 26)

examined by use of the Mann–Whitney U statistical test. A significance level of $p<0.05$ was chosen for data analysis, though adjusted to a Bonferroni alpha of 0.007 to reduce type I error.

RESULTS

A moderate correlation of $r = 0.58$ ($p<0.001$) was found between the ABC Scale and the DGI score in the total sample (Figure 1). Data analysis of subjects, according to the degree of caloric weakness, revealed that there was a stronger correlation between the ABC Scale and the DGI in those with mild or moderate peripheral weakness than in those with severe or total weakness (Table 3, figures 2 and 3). A comparison of these groups, however, revealed that the differences were not statistically significant (ABC Scale: $r = 0.19$, $p>0.05$; DGI score: $r = 0.07$, $p>0.05$). The correlation between the ABC Scale and the DGI score was equal ($r = 0.48$) between those with severe or total weakness and those with normal caloric testing.

When analysis was completed of those with mild or moderate and severe or total peripheral vestibular weakness, excluding those with normal caloric test values, a correlation of $r = 0.65$ between the ABC Scale and the DGI score was noted. The mean ABC Scale and DGI scores of this group were 51 and 16, respectively.

Spearman rank–order correlation by age intervals (selected to maintain similar n sizes) revealed a strong correlation ($r = 0.72$) in the 20–39-year-old age group in comparison with moderate correlations in the older age groups (Table 4). Statistical analysis by age groups, with 65 years of age as a cut-off point, suggested similar strengths of correlation (<65 years old, $r = 0.59$; ≥ 65 years old, $r = 0.61$).

Student's t-test analysis of the ABC Scale scores indicated there was no significant difference in the scores when analysed by the three age intervals and degree of peripheral weakness. Mann–Whitney U test analysis also revealed no statistically significant difference in the DGI scores when analysed by age intervals and degree of peripheral weakness.

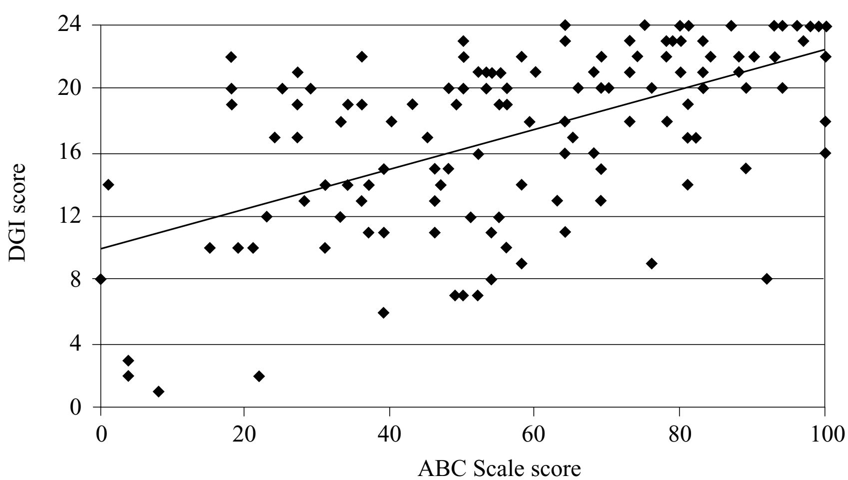

FIGURE 1: The correlation of the ABC Scale and the DGI scores ($n = 137$). ◆ ABC = Activities-specific Balance Confidence scale; DGI = Dynamic Gait Index.

TABLE 3: Spearman rank–order correlation of the Activities-specific Balance Confidence Scale score and Dynamic Gait Index by degree of caloric weakness in people with peripheral vestibular disorders

Degree of weakness	n	r	p	t
Mild or moderate weakness	33	0.72	< 0.001	5.83
Severe or total weakness	31	0.48	< 0.001	2.91
Normal calorics	73	0.48	0.001	4.50

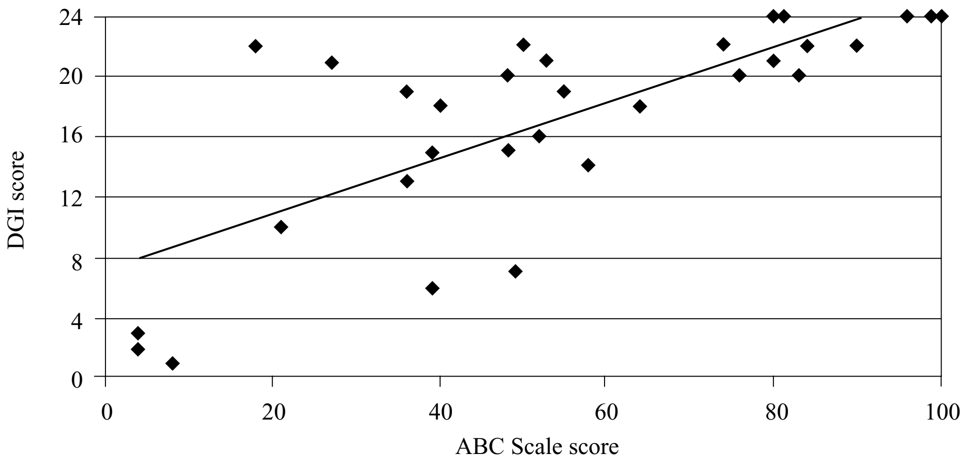

FIGURE 2: The correlation of the ABC Scale and the DGI in people with peripheral loss with mild to moderate caloric findings. ◆ ABC = Activities-specific Balance Confidence scale; DGI = Dynamic Gait Index; Mild or moderate = 25–60%.

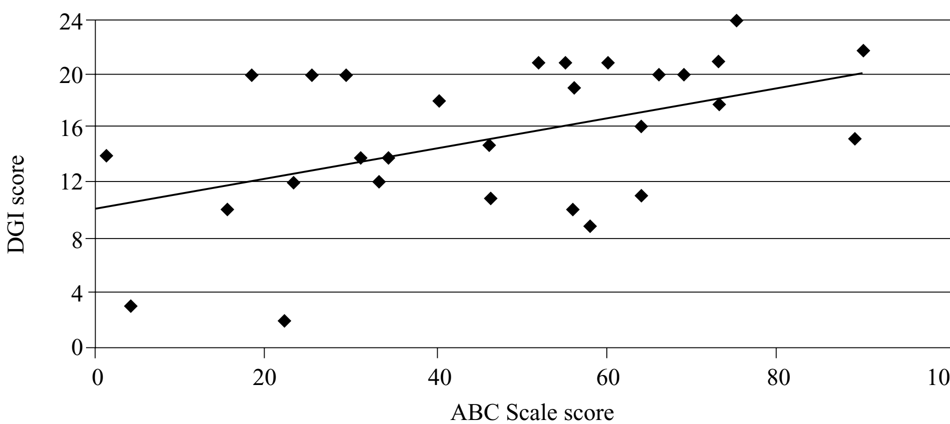

FIGURE 3: The correlation of the ABC Scale and the DGI in people with peripheral vestibular loss with severe or total caloric findings. ◆ ABC = Activities-specific Balance Confidence scale; DGI = Dynamic Gait Index; Severe or total = >60%.

TABLE 4: Spearman rank–order correlation of the Activities-specific Balance Confidence Scale score and Dynamic Gait Index by age group

Age group	n	r	p	t
All subjects	137	0.58	< 0.001	8.25
20–49 years	36	0.72	< 0.001	6.02
50–69 years	53	0.46	0.001	3.67
70–89 years	48	0.57	< 0.001	4.60

When individuals with BPPV (23% of sample) were excluded from the analysis, the data suggested that there was no difference in the correlation of the ABC Scale scores and the DGI scores in data groupings by age or degree of caloric weakness (Table 5). A correlation of $r = 0.49$ ($p = 0.004$) between the ABC Scale score and the DGI score was noted when only those with BPPV were analysed.

DISCUSSION

A moderate correlation existed between decreased balance confidence and poorer walking in the total sample of people with peripheral vestibular disorders, supporting the original hypothesis. A subtle, though highly complex, interaction of head and eye movements occurs during walking, so that there is vertical translation of the head, head pitch rotation and horizontal head rotation that occur in a co-ordinated manner throughout the gait cycle (Mergner et al., 1997; Hiraski et al., 1999). Head stabilization and vestibulo-ocular reflex (VOR) function also work to provide a stable visual environment (Pozzo et al., 1991; Herdman et al., 1998; Hiraski et al., 1999). In people with vestibular dysfunction there is evidence that supports decreased head stabilization (Grossman and Leigh, 1990; Pozzo et al., 1991; Hillman et al., 1999; Hiraski et al., 1999), greater gaze instability (Grossman et al., 1989; Grossman and Leigh, 1990; Hillman et al., 1999) and decreased function of the VOR (Grossman and Leigh, 1990; Hillman et al., 1998). Given these changes in head and eye movements in individuals with vestibular dysfunction, impaired eye or head movements may contribute to decreased balance confidence and increased gait dysfunction. Further research is warranted to identify if these changes contribute and to what degree they may cause decreased balance confidence and gait dysfunction.

Bamiou et al. (1999) examined the degree of disability and handicap in people

TABLE 5: Spearman rank–order correlation of the Activities-specific Balance Confidence Scale score and Dynamic Gait Index by degree of caloric weakness, excluding subjects with Benign Paroxysmal Positional Vertigo

Degree of weakness	n	r	p	t
Mild or moderate weakness	27	0.64	0.004	4.12
Severe or total weakness	26	0.48	0.010	2.70
Normal calorics	48	0.49	0.005	3.77

with mild or moderate and severe or total vestibular weakness. They found that the vestibular symptoms experienced by those with mild or moderate peripheral weakness were more severe and interfered with daily life activities more so than in those with severe or total weakness. The results of the present study support these findings, so that the strongest correlation between balance confidence and gait dysfunction was found in those with mild or moderate vestibular weakness. In contrast, however, there was no statistically significant difference between the ABC Scale or the DGI scores in the mild or moderate versus the severe or total weakness groups. Examination of the mean scores revealed a lower ABC Scale (mean 46.6) and DGI score (mean 15.4) in the severe or total weakness group as compared with the mild or moderate weakness group (Table 1). This was consistent with the data of Bamiou and colleagues' (1999) research, where greater disability was noted in the severe or total weakness group. Hall et al. (2004) reported mean DGI scores of 14.9 at the onset of physiotherapy in people with unilateral vestibular loss, indicating that the DGI scores of the present sample are similar to theirs. They did not report the DGI scores based on degree of caloric weakness. These findings suggest that the vestibular symptoms experienced by those with mild or moderate peripheral weakness may contribute more to impaired balance confidence, and thus gait disturbances, than in those with severe or total weakness as it may be easier for the brain to adapt to no signal versus an abnormal signal.

In the present study, 35% of the subjects were identified as having 'normal' caloric test results. This group was found to have higher ABC Scale scores (mean 63), suggesting greater balance confidence than in the mild or moderate weakness and the severe or total weakness groups (Table 1). In contrast to this, the DGI scores (mean 18) of those with normal caloric testing were similar to those of the mild or moderate weakness group. Both the mean ABC Scale score and the DGI score of those with normal caloric test results reflect impairment. Minimal research has examined those with normal caloric test results and the presence of vestibular symptoms and compared them with those with identified unilateral peripheral weakness (with abnormal caloric test results) (Jacobson and Calder, 2000). Jacobson and Calder (2000) compared a normal subject group with those with unilateral and bilateral peripheral weakness using caloric, ocular motility and rotational testing. They found significant differences between the normal and unilateral or bilateral weakness groups on the physical subscale of the Dizziness Handicap Inventory (DHI) (Jacobson and Newman, 1990). The findings of the present study raise questions for healthcare professionals when 'normal' caloric test results are seen. The perception may be that there are no significant functional limitations or disabilities in those with normal caloric test results, although the findings of the present study suggest that may not be the case.

The effects of aging were not a factor affecting the relationship between balance confidence and gait dysfunction. The data analysis by age intervals revealed a strong correlation between balance confidence and gait dysfunction in the younger group (20–49-year-olds) in comparison with the older age groups. Although it was hypothesized that aging would increase the strength of the relationship between balance confidence and gait dysfunction, these results confirm that increasing age, in itself, did not affect their perceived balance confidence and dynamic walking. This finding is consistent with that of Whitney et al. (2002) in a comparison of rehabilitation outcomes between individuals with vestibular dysfunction who were 20–40 years old and those who were 60–80 years old and others with unilateral vestibular loss (Cohen and Kimball, 2004; Hall et al., 2004). When similar age intervals of this dataset were analysed, the correlation remained stronger in the 20–39-year-old group (r = 0.71; p = 0.004) than in the 60–79-year-old group (r = 0.56; p<0.0001). Whitney and colleagues (2002) noted trends in their studies towards the younger adults being more impaired and having increased falls (Whitney et al., 1999), and exhibiting decreased balance confidence in comparison with their older counterparts. The results of the present study add to this evidence, with a strong correlation between balance confidence and gait dysfunction in the 20–49-year-old age interval. Those in the younger age group may be more impaired by their decreased balance confidence, as their vestibular disorder may have caused a dramatic change in how they perform day-to-day activities in a lifestyle that demands a greater movement repertoire. In the older age groups, many adaptations to slower movement and decreased demands may have already occurred unknowingly.

Quantification of decreased balance confidence in those with peripheral vestibular dysfunction was of particular interest to the investigators in the present study. Examination of the data revealed mean ABC Scale scores in the low end of the 50–80 range in the total sample (mean = 58). Mean ABC Scale scores across all age groups were in the range of 54–61, consistent with the functioning of older adults in retirement homes, using the benchmarks set forth by Myers et al. (1998) for older adults. Based on the work of Lajoie and Gallagher (2004), 84 (61%) of the sample of patients may be at risk for falling. Twenty-two (67%) of those with mild or moderate weakness and 25 (81%) with severe or total weakness were at risk of falling using the cut-off score of <67% ABC Scale score (Lajoie and Gallagher, 2004). These results confirm decreased balance confidence as a serious issue for this patient population, inherently suggesting that attention and emphasis on this problem by physiotherapists is necessary in their assessment procedures and interventions. Low ABC Scale scores suggest the potential for limitations in activity participation, social isolation, and increased risk of functional decline and loss of independence, as has been seen in older adults with decreased balance confidence (Stelmach and Worringham, 1985; Tinetti et al., 1994; McAuley et al., 1997; Cumming et al., 2000).

The DGI, with a total score of ≤19/24, has been shown to be a valid indicator of dynamic balance and gait instability in older adults (Shumway-Cook et al., 1997) and in those with vestibular disorders (Whitney et al., 2000a). Mean DGI scores in the present study were below 19/24 in all groups analysed. In the total sample of 137 individuals, 76 (56%) had a DGI score indicating they were at risk for falling. This confirmation of increased fall risk in this population is important and the consequences to gait function must be considered. Although total DGI scores were examined in the present study, future investigations could determine if there are specific items on the DGI (for example, walking with head movement) that demonstrate greater correlation with reports of falls and decreased balance confidence.

Analysis of these data, excluding those individuals with BPPV, demonstrated no apparent differences in the correlation between decreased balance confidence and gait dysfunction. The correlation of decreased balance confidence and gait dysfunction was not strong in those with BPPV. Although BPPV is usually easy to treat and typically there is improvement of postural control after treatment, the mild unsteadiness that often lingers may contribute to decreased balance confidence (DiGirolamo et al., 1998; Whitney et al., 1999). In the present study, most ABC Scale and DGI scores were obtained before treatment for BPPV. The mean duration of symptoms for all subjects with BPPV was 32 months (range 1–560 months). This may be a contributing factor to the development of decreased balance confidence in this patient group, although length of symptoms was not statistically significant between the mild or moderate weakness and severe or total weakness groups and has not been shown to be a significant factor in outcomes in people with unilateral vestibular loss (Cohen and Kimball, 2004; Hall et al., 2004).

The analysis by degree of peripheral weakness using caloric testing provides information to physiotherapists of a patient profile to consider, anticipating decreased balance confidence with increased vestibular symptoms more characteristic of mild or moderate caloric weakness. The inherent limitation of the present study was in the correlational design that did not allow cause–effect determination between the degree of caloric weakness and the DGI and ABC Scale scores.

The results of the present study have clinical significance for physiotherapists involved in the management of people with peripheral vestibular dysfunction. The present study confirmed the pervasiveness of decreased balance confidence and gait dysfunction as problems of people with peripheral vestibular dysfunction. Decreased balance confidence is not an obvious deficit and may not receive adequate attention. Myers and colleagues (1996) demonstrated with older adults that successful performance of tasks (such as those identified in the ABC Scale) exerted the strongest influence on improved balance confidence. This functional intervention approach has been used with people with peripheral vestibular dysfunction (Cohen 1992), although studies have not investigated the direct impact on balance confidence. In addition to evaluating gait dysfunction, it appears important to also attempt to quantify and enhance patients' balance confidence.

CONCLUSION

As a result of peripheral vestibular dysfunction, patients experience vertigo, dizziness, postural instability, decreased balance confidence and gait dysfunction. The ABC Scale identified decreased balance confidence as a significant limitation in this population, at a level characteristic of those with chronic health conditions and living in a retirement home setting. The DGI and ABC Scale identified that more than half of this sample was at risk for falling. Consideration of the degree of peripheral vestibular weakness is beneficial to healthcare providers, in that it adds to patients' profiles of symptom and disability expectations. Younger patients exhibit a stronger correlation between decreased balance confidence and gait dysfunction. Each of these findings underscores the need for attention to the psychological and functional consequences of peripheral vestibular dysfunction across the lifespan. Since the correlation was mild to moderate between the two instruments (paper and pencil versus judgement of patients' walking), it appears that both instruments should be used in clinical practice to determine improvement in people with unilateral peripheral vestibular loss.

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